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ADDRESS
AT THE
ANNIVERSARY MEETING
OF THE
ROYAL GEOGRAPHICAL SOCIETY,
22nd May, 1871.

BY
SIR RODERICK IMPEY MURCHISON, BART., K.C.B.,
G.C.St.A. AND St.S., D.O.L., LL.D., F.R.S., &c.,
DIRECTOR-GENERAL GEOLOGICAL SURVEY,
PRESIDENT.

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A D D R E S S

TO THE

ROYAL GEOGRAPHICAL SOCIETY
OF LONDON;

DELIVERED

AT THE ANNIVERSARY MEETING

ON THE

22ND MAY, 1871.

BY

SIR RODERICK IMPEY MURCHISON, BART., K.C.B.,
G.C.St.A. AND St.S., D.O.L., LL.D., F.R.S.,
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A D D R E S S
TO
THE ROYAL GEOGRAPHICAL SOCIETY.

Delivered at the Anniversary Meeting on the 22nd May, 1871.

BY SIR RODERICK IMPEY MURCHISON, BART., K.C.B.,
PRESIDENT.

GENTLEMEN,

When I last addressed you, at the commencement of the present Session, I was then the medium of the expression of your thanks to the Managers of the Royal Institution, for their kind consideration, by which we had been enabled to hold our meetings in their Theatre.

Now, when, through a heavy stroke of illness, I have since been unable to be among you, I beg to congratulate you on the success which has attended the appeal which I made in your name to the Chancellor and Senate of the University of London, to permit us to hold our meetings in the Grand Hall of their magnificent new edifice; and I did so because our Council had already determined, to my entire satisfaction, that the offices and map-rooms of our Society should be established in Savile-Row, in the immediate neighbourhood of the London University.

Although I have been prevented from attending any meeting in the Great Hall in which you have been assembled during the present Session, I rejoice to learn that you are admirably located therein: whilst it is most satisfactory to know that, when our adjacent new edifice is completed, there will be in it a room not only large enough to receive all our maps and illustrations, but also to contain as many members as usually frequent our ordinary evening meetings, should we in future find it necessary to avail ourselves of it.

The total number of our Fellows is still on the increase, and now

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It was a very interesting day; in the ... the ... percentage ... of ... by ... of ... in a large number: in the ... of ... from 37 of the ... were ... in the ... of ... and ... I will in the first instance ... of ... and ... which ... we have to ...

The Duke of Clarence.—By the decease of Lord Clarendon, in the Duke's ... the country has been deprived of one of her most able and distinguished statesmen, who, in addition to his political ... was always a warm promoter of geographical ... and a warm friend of our Society. Born in 1800, he entered the Imperial Service in 1820. In 1825 he was appointed a Commissioner of Excise, and in that capacity arranged the union of the English and Irish Excise Boards (in 1828-29). In 1831 he negotiated a commercial treaty with France; and in 1832, when he was Her Majesty's Representative in Spain, he mainly assisted in bringing about the Treaty of the Quadruple Alliance. In the above-mentioned capacities he was well known as the Honorable George Villiers; and by the death of his uncle, the Earl of Clarendon, he succeeded to the title in December, 1833. As such, he was appointed Lord Privy Seal in 1840, and later in the same year he became Chancellor of the Duchy of Lancaster. In 1846 he was appointed President of the Board of Trade, and in the same year became Lord-Lieutenant of Ireland, which country he governed during a very arduous period till 1853, when he became Secretary for Foreign Affairs,—an office in which he greatly distinguished himself, and in which he signed the Treaty of Paris in 1856.

Lord Clarendon was, throughout his career, a strong advocate for Free Trade; and it is well known that it was very much through his influence the Emperor Louis Napoleon was induced to apply that doctrine, for the first time, in the government of France.

In society and private life, Lord Clarendon was generally beloved, whilst his very engaging manners rendered him justly a great favourite among foreign diplomatists. On my own part, I am proud to say that he honoured me with his personal friendship; and it was at his country seat, "The Grove," that I had opportunity of admiring the fine qualities of his heart, as shown when

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in intercourse with his affectionate and devoted children, admirably brought up, as they had been, by a most accomplished mother.

WILHELM VON HAIDINGER.—Of our late Foreign associate, Wilhelm Ritter von Haidinger, it may be truly said that no single person had in his own country done more to arouse a spirit of interest and study in the various provinces of Natural Science.

Born at Vienna in 1795, Haidinger, at an early age, devoted himself to scientific labours; and for a number of years succeeding 1812 gave a special direction to his inquiries by becoming the pupil and friend of Friedrich Mohs, the distinguished mineralogist, at Gratz and Freiberg. From the year 1822 to 1827, as a worker in mineralogy, he travelled over a great part of Europe; and resided for some time at Edinburgh, where he published, in the English language, a translation of the Treatise by Mohs, in three volumes, 8vo., besides communicating to various scientific Societies and periodicals a large number of papers on special subjects.

For some years after this, he lived at Elbogen in North Bohemia, where his two brothers were conducting a porcelain manufactory, and at which place his kind and instructive hospitality to travellers will not readily be forgotten, by those who had the good fortune to stray thither from Carlsbad or the Erzgebirge. Invited by the accomplished Bohemian nobleman Fürst von Lobkovitz, who was then Minister in the Department of Mint and Mines, Haidinger, in 1840, accepted the direction of a new Museum, initiated, under Mohs, at the Imperial Mint of Vienna, with the particular object of promoting a knowledge of the mineral resources of the country. Only a few years elapsed before he was able to place so conclusively before the Austrian Government the advantages of a geological survey, that he was commissioned to organise that important national work, which, in conjunction with its museum, he continued to superintend till October, 1866. The mental activity of this amiable man—unwearied, in spite of delicate health—led him to constant exertion in the spreading of associations for the cultivation of science; and to him is, in a great measure, due the foundation of the Imperial and Royal Geographical Society of Vienna, as well as other institutions in Hungary, in Moravia, and at Milan. He deserves, too, the credit of having been mainly instrumental in paving the way for the publication of a most interesting chapter in modern geography, viz., the results of the voyage of the Austrian frigate the *Novara*. Our Society enrolled him as one of its Honorary Members in the year 1856.

Haidinger enjoyed the satisfaction of seeing a new scientific life spring up around him, and of committing the direction of his establishments to the able hands of Franz von Hauer and others of his former pupils.

Occupied to the last in scientific research, especially in all that related to meteorites, Haidinger passed the last few years of his life in comparative retirement, in his country-house at Dornbach, near Vienna, where he died on the 19th of March last.

BARON CHARLES ALEXANDER VON HÜGEL, a distinguished Austrian nobleman, and one of our Honorary Corresponding Members, died at Brussels on the 2nd of June, 1870, in the seventy-sixth year of his age. He was an eminent traveller and geographer, and had earned solid reputation for his travels in North-western India, Kashmere, China, and Australia, in the years 1835-40, concerning which he published his '*Kaschmir und das Reich der Siek*;' '*Das Kabul-Becken und die Gebirge zwischen dem Hindu Kosch und dem Sutlej*;' and other works. A thoughtful observer, and well-grounded in various branches of science, these records of his long journeys were an important contribution to the stock of human knowledge, and will ever be consulted by all who are occupied in scientific investigations, and particularly in the various branches of Natural History. For this distinguished service we rewarded him with our Patron's Medal at our Anniversary Meeting in 1849. His principal work, under the title of '*Travels in Kashmir and the Punjab*,' was translated into English by Major Jarvis, and published in 1845. After his travels he filled successively many important diplomatic posts, and at the time of his death was Austrian Minister at the Belgian Court. Personally, I was intimately acquainted with this most intelligent and agreeable man, whose reputation stood very high among Austrian politicians, Prince Metternich having been his constant friend and supporter.

LORD DE BLAQUIERE.—By the death of Lord de Blaquiére I have lost an old friend, who zealously joined the Society under my Presidency, and I am happy to record of him that he became one of my most active supporters in the defence of ex-Governor Eyre.

Among other private friends who also joined the Society under my Presidency, I may enumerate Colonel SOTHEY, son of the eminent poet, who had been for many years a constant attendant at our meetings; and SIR GEORGE PHILIP LEE, a most accomplished gentleman and a distinguished musician.

SIR ROBERT G. COLQUHOUN, K.C.B.—This excellent man was long

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known as Consul-General in Egypt, in which capacity he was of signal service in promoting the cause of geography. He actively assisted in the succour of our distinguished countrymen, Speke and Grant, on their emerging from the heart of South Africa. He was also a warm friend of Sir Samuel and Lady Baker. On his return from his consular services he was created a K.C.B., and shortly afterwards married, as his second wife, Anne, only daughter of W. Cattrow, Esq. He died, at his paternal seat of Carnstraden, Dumbartonshire, on the 10th of December of last year. Sir Robert G. Colquhoun was very highly esteemed by all the chiefs of the Foreign Office under whom he served, and also by a very numerous circle of friends.

SIR JAMES CLARK, Bart., K.C.B., M.D., F.R.S., &c.—Few men of this age have been more beloved and respected than this eminent physician, who, through his intimacy with the Queen and Royal Family, lost no opportunity by which he could advance science. He was a distinguished chemist, and had the great merit of establishing the Royal College of Chemistry, under the auspices of His Royal Highness Prince Albert. It was through his advice that the Queen fixed upon Balmoral as her Scottish summer residence; and so esteemed was he by Her Majesty that she assigned to him during his life the Royal demesne of Bagshot Park, where he died on the 29th June, 1870, in his eighty-fourth year.

SIR WILLIAM THOMAS DENISON, K.C.B., one of the oldest members of our Society, was a man of remarkable energy, who, in addition to his scientific acquirements as an officer in the Royal Engineers, possessed great administrative abilities. He was the third son of the late Mr. John Denison, M.P., of Ossington Hall, Notts, and brother of the present Speaker of the House of Commons, and of the late Bishop of Salisbury. He was born on the 3rd of May, 1804, and entered the army in 1826, becoming a Colonel of his corps in 1860. He was best known, however, as Governor of one or other of our colonial possessions. His first appointment was to the Lieutenant-Governorship of Van Dieman's Land, in June, 1846, when he received the honour of knighthood. Subsequently he became Governor of New South Wales, and in 1860 received the important appointment of Governor of Madras, which post he occupied until 1866. During this time he was temporarily Governor-General of India in the interval between the death of the Earl of Elgin and the arrival of Sir John Lawrence in January, 1864. He died on the 19th of January last. On my own part, I deeply regret the death of

this most active and intelligent public servant, who was a geologist as well as a geographer. For, whether as Governor in Australia or at Madras, he never failed to make me acquainted with the Natural History features of those countries.

Major-General SIR JUSTIN SHEIL, whose death occurred, after a short illness, on the 13th of April last, had distinguished himself in the military and diplomatic services of our Indian Empire. He entered the Bengal Native Infantry in 1820, and received the medal and clasp for the siege of Bhurtpoor. In 1833 he was sent to Persia as second in command of a detachment of officers and sergeants employed to discipline the Shah's army. His service in Persia on this occasion had important results on his subsequent successful career. In 1844 he was appointed Envoy and Minister at the Court of the Shah, which post he held till October, 1854; and in 1848 he received permission to accept and wear the 1st class Order of the Lion and Sun, conferred upon him by the Shah. He was made K.C.B. in 1855, after representing British interests at the Persian Court to the great satisfaction both of his own Government and that of the Shah. Sir Justin was brother of the well-known Right Hon. Richard Lalor Sheil, Member for Dungarvan. In 1856, his accomplished and amiable wife published an account of her Persian experiences, under the title of 'Glimpses of Life and Manners in Persia.' Sir Justin became a Fellow of our Society in 1857, and served as a Member of our Council in 1861. He was a frequent attendant at our evening meetings, and was often to be seen in the Library of the Society, making use of the treasures of Geographical literature there stored for the use of the Fellows. He was one of those supporters whose loss I much deplore.

Captain BURGEOYNE, R.N.—The Society, as well as the Royal Navy, have to mourn the loss of a gallant member in Captain Hugh Burgoyne, who perished with a number of officers, the *élite* of their profession, and five hundred brave seamen, in H.M.S. *Captain*, on the night of the 6th September, 1870, in the Bay of Biscay.

Captain Burgoyne was the only son of that eminent soldier, Field-Marshal Sir John Burgoyne, G.C.B. Although only thirty-seven years of age, he had served since 1847 in the Navy, and in those twenty-three years had earned a repute which gave high promise of a brilliant career. Brought up in his profession by some of its best officers, he was second to none of our captains as a thorough practical seaman, with a varied experience in every quarter of the globe. He was one of the few officers in the Royal

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Navy, during the Crimean War, who had an opportunity of winning the Victoria Cross for gallantry in the Sea of Azov. His marked intelligence and freedom from professional prejudice induced the late Captain Cowper Coles, the inventor of the turret principle, to select him as the officer best qualified to test the great, but fatal, experiment put to the proof by *H.M.S. Captain*.

His untimely fate, and that of his noble shipmates, was a sacrifice to the good of their profession and country, by calling the attention of the Admiralty to the lamentable want of stability in many ships of our ironclad fleet. Although our Society may mourn his loss, yet we and his profession may justly be proud of an officer who nobly perished in the execution of his duty.

I owe this brief sketch of the lamented Hugh Burgoyne to his dear and attached comrade Capt. Sherard Osborn. Much more detailed knowledge of the deceased will eventually appear when his illustrious father can be appealed to, to speak of the qualifications of his dearly beloved only son—for as yet the venerable Field-Marshal is scarcely able to realize the irreparable loss he has sustained.

Mr. MARTIN CROFTON MORRISON, one of the best Chinese scholars of the day, and who had availed himself of his knowledge of the language and manners of the people to collect, with great toil and at much cost and risk, a mass of information relating to the north-eastern provinces of China, was the third son of the Rev. Dr. Morrison, author of the first Chinese and English Dictionary, and translator into Chinese of the Bible, Prayer-Book, and many other works. His mother was the eldest daughter of an Irish gentleman, Martin Crofton Armstrong, of Mohil House, county Leitrim.

Mr. Morrison was born on the 4th July, 1827, and received his general education under private tutors. For a couple of years he studied Chinese with Professor Kidd at University College, London. In 1843, having been appointed to the Chinese establishment by the Government of Lord Aberdeen, he left England to join his elder brother, who, with Sir Henry Pottinger, negotiated the Treaty of Nankin, and who was, at that time, Member of Council and Chinese Secretary to the Government at Hong-Kong. Very soon after his arrival his brother died; and he was thus left, at the age of sixteen, without guide or protector. But, even as a boy, Mr. Morrison was remarkable for thorough conscientiousness and for tenacity of purpose; and he earned the entire approval of his chiefs by diligent study and exemplary

conduct. He served in the capacities of Assistant Chinese Secretary, Vice-Consul, and Consul at various ports, till ill-health compelled him to retire from the service in 1866. During that long period his explorations were mostly confined to the provinces northward of the River Yang-tsze-kiang. The chief subject of geographical interest which he witnessed and examined, long before the visit of Mr. Elias, recorded in our 'Journal,' was the extraordinary alteration in the course of the Hoang-ho, or Yellow River, which, at about 2000 miles from its mouth, was abruptly changed from the general direction of E.S.E. to N.E.—an angle of over 60°—and now runs through the province of Shan-tung and empties itself into the Gulf of Pechili, about 430 miles from its former mouth, reckoning along the coast. Another topic was the Chinese rebellion, which greatly impeded his progress and rendered travelling at times very dangerous. Although these two subjects have each their distinctive characters, yet it was Mr. Morrison's opinion that it was possible to trace where the rebellion helped to effect or accelerate the great physical change in the river.

By his premature death, in November last, Mr. Morrison was stopped in the work on which he had been engaged ever since his return home, namely, a map showing the different trade-routes between India and China, and in putting into available form the knowledge he had acquired of the geographical, geological, political, and commercial conditions of these districts; and it is to be feared that no one else is qualified fully to utilise the materials he has left behind him. According to the testimony of all who knew him, Crofton Morrison well succeeded in following the examples of the father and brother he revered; and as his modesty, perfect unselfishness, and genuine kindness of disposition gained him the affection, so did his abilities, love of justice, and blamelessness of life secure him the respect alike of Europeans and Chinese.

Captain C. D. CAMERON.—Captain Cameron, under the name of Consul Cameron, was well known to the public as the unlucky prisoner of King Theodore, and one of the causes of the costly but brilliant Abyssinian war. Previous to his appointment as British Consul at Massowah he was known chiefly as having served with distinction in the Kaffir War, and as having been a member of the staff of Sir W. Fenwick Williams, when that gallant officer was engaged in organising the defences of the Turks in Kurdistan and

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Armenia, during the Crimean War. He was then given the local rank of captain in Turkey, and was placed by his chief in superintendence of the fortifications which were being erected in Erzerum. After the war he served as Vice-Consul at Redout Kalé and at Poti, and was appointed Consul at Massowah in 1860, commencing his duties at that place in January, 1862. He became a member of our Society in 1858, but did not contribute to our Geographical publications in any way. He died on the 30th of May last.

THOMAS BRASSEY, M.P., the successful Railway Contractor, had been a Fellow of our Society since the year 1860. By the surveys performed under his orders for the many railways he undertook to construct in the Colonies and in foreign countries, he may be said to have been a contributor to the common stock of Geographical knowledge. He was born in 1805 at Boughton, in Cheshire, and died on the 8th of December last, at St. Leonard's, whither he had resorted for the benefit of his health. As a writer in the 'Times,' to whom I am indebted for these details, observes, a fair idea of the magnitude of Mr. Brassey's operations may be gathered from the fact that in the thirteen years, from 1848 to 1861 inclusive, he made, either directly or in association with others, 2374 miles of railway, at a contract price of nearly twenty-eight millions of pounds sterling. While his activity, intelligence, and probity in carrying out these great enterprises secured for him, towards the end of his career, a colossal fortune, he was throughout life esteemed for his benevolence and generosity. Many of his foreign undertakings, especially the flying railway over Mont Cenis, proved, in a pecuniary point of view, disastrous speculations to him; but such was the large view he took of everything upon which he was engaged, and such his steadiness of purpose and integrity, that although ample cause was given him to get rid of such bargains through failure of periodical payments, he always insisted upon carrying out his engagements to the letter.

Among other deceased members, though not men of science, many have been noted in other walks of life. These are:—Sir Edmund Antrobus, the respected partner in the house of Coutts and Co., General Akrell, Rev. C. D. Brereton, Mr. James Barrett, Captain Thomas Birch, Mr. J. O. Balfour, Mr. H. Blackett, Mr. J. C. C. Bell, Mr. H. Blanchard, Mr. D. Chambers, Mr. C. H. Dickson, Mr. W. F. de Gex, Mr. J. W. Dover, Mr. F. A. Goodenough,

Admiral Robert Gordon, Mr. J. Gibson, Mr. J. A. Hessey, Mr. J. Henderson, Rev. Sir H. J. Ingilby, Mr. F. F. Jeyes, Mr. R. W. Kennard, Sir J. Kirkland, Mr. R. Low, Dr. J. L. Learmouth, Mr. J. Mackillop, Mr. J. McEwan, Mr. J. Phillips, Admiral M. Quin, Colonel G. W. Raikes, Mr. G. R. Smith, Mr. G. Smith, Mr. J. S. Smith, Mr. O. H. Smith, Colonel Sir A. C. Sterling, K.C.B., distinguished on the staff of Field-Marshal Lord Clyde, Mr. H. Thorold, Rev. W. H. Walker, Mr. A. E. Way, Mr. A. Walker, Sir H. E. Young, Lieut.-Colonel M. W. Gladdish, Mr. W. H. Blaaw, and Major-General F. H. Robe, C.B.

ADMIRALTY SURVEYS.*

The following is a brief outline of the Hydrographical operations which have been carried out, under the Admiralty, on home and foreign coasts during the past year.

Upon the east coast of England, Staff-Captain Calver and his three assistants, in H.M.S. *Porcupine*, were engaged, during the early part of the season, at the head of the Lynn Deep, in furtherance of a complete re-survey of that extensive estuary known as the Wash, wherein many important changes had occurred since it was examined by the late Captain Hewitt, R.N., upwards of forty years since.

During the middle and latter part of the summer the *Porcupine* resumed her interesting occupation of the previous year in the scientific investigation of the deep sea. The objects proposed on this occasion were a minute survey, physical and zoological, of the Atlantic slope along the coasts of Spain and Portugal, of the Strait of Gibraltar, and along the shores of the Mediterranean as far as Malta. The results, so far as the examinations extended, were eminently satisfactory; many interesting observations were made on the temperatures at various depths, and much new light thrown on the systems of ocean circulation and the connexion between the currents of the Mediterranean and the Atlantic Ocean.

Some very valuable observations were especially made both of the surface and under-currents in the Strait of Gibraltar by Dr. Carpenter, aided by the practical skill and ready resource of Captain Calver, with the view of settling this important problem; but, over so wide a field of research, it is obvious that much

* Communicated by Rear-Admiral G. H. Richards, F.R.S., Hydrographer.

must still remain to be done before any fixed and satisfactory laws can be laid down and finally recognised; and for this we must hope for future investigations. It may be mentioned, in connexion with submarine currents in this region, that the Falmouth and Gibraltar cable, which was laid in June, 1870, and which failed to work a few months since, was found, when recovered, to have been chafed, in several places, as fine as a knife-edge, which, by those engaged in its recovery, is attributed to the action of a considerable current over a rocky, uneven bottom: this opinion, however, is as yet by no means clearly demonstrated. The fracture in the cable occurred in a depth of 500 fathoms of water, 100 miles westward of the Strait of Gibraltar, and about 60 miles south of the River Guadiana, where the surface current is not considerable.

For a full and scientific account of these researches, the reader is referred to the narrative drawn up by Dr. Carpenter and Mr. Gwyn Jeffreys, published in the 'Proceedings of the Royal Society,' No. 125, Vol. xix.

H.M.S. *Lightning*, under Staff-Commander John Richards, whose services are devoted to the western shores of England and the coasts of Ireland, was specially diverted from this service, during the early part of 1870, for the purpose of minutely surveying a section of the Strait of Dover, between the South Foreland and Cape Grisnez, with a view to possible engineering operations. The survey was carried out by running continuous lines of soundings from the neighbourhood of the Foreland to within 3 miles of the French coast.

Along the three central lines of this section soundings were obtained about 400 feet apart, the bottom being probed at each cast (by a machine, constructed for the purpose, weighing 7 cwts.) to an average depth of 8 inches, and specimens of the soil brought up. It may be interesting to state further that, on the oozy bank off Dover, the probing machine penetrated to a depth of nearly 5 feet, while in the offing 14 inches was the greatest depth reached, of which 6 inches consisted of drifting substances, such as gravel, sand, stones, &c., overlying 8 inches of chalk, the upper part of the latter, generally soft, hardening with the descent. Numerous fine specimens of chalk, of various colours, were obtained. But frequently the machine would not penetrate at all, and in some cases, where the attempts were repeated, the lower part of the probe was repeatedly broken and destroyed by contact with the hard bottom. The substrata of bottom of the Channel from the Foreland across

to near Cape Grisnez was found to consist entirely of chalk, but varying much in density as well as in colour; white and grey prevailing near the Foreland and in mid-channel, and brown as Cape Grisnez was approached. Veins of soft chalk, resembling pipeclay and varying in colour according to situation, were occasionally met with; but the general character of the ground was hard and very uneven, especially from mid-channel towards the French coast, where the great strength of the tidal stream appeared to have swept away drifting substances, and even to have hollowed out the soft veins of chalk, leaving only the hard ridges between.

The result of this survey seems to prove, from the unevenness of the ground and the strength of the current, unfavourable to a scheme which has been proposed of connecting this country with France by an iron tubular subway, though not unfavourable to a tunnel.

During the latter part of the season the *Lightning*, under Staff-Commanders Richards and W. B. Calver, was occupied in making a new survey of the estuary of the River Dee and its approaches, which were found to have much changed since the survey of 1859.

The Survey of Portsmouth and its neighbourhood has been conducted by Staff-Commander D. Hall, with a steam launch and a small party. During the past season a minute measurement has been made of the depths on the Bar of Portsmouth Harbour, an operation which it is highly necessary to make periodically, in order that timely measures may be taken to maintain the channel at a depth of 20 feet, or nearly so, at low water.

These successive examinations have shown that the deepening of the entrance to our greatest Naval dépôt, which was effected by dredging between the years 1858 and 1863, has proved a great success: nevertheless, some further dredging operations are required, principally to carry out conditions not strictly fulfilled on the occasions referred to.

Now that the bed of the Channel has assumed a position of perfect rest, it is most desirable that these operations should not be delayed.

Commander Hall has also resurveyed the Medina River on a large scale, with the view to deepening certain parts of the channel by dredging; and plans on 30 inches to a mile have been constructed of the upper portions of Portsmouth and Langston harbours, showing the connecting channel facing Hilsa lines which has been excavated for the passage of gunboats.

Tidal diagrams have also been constructed, with the view of

showing the probable effect which would be produced on the bar of Portsmouth by connecting the tidal waters of the two harbours.

Mediterranean and Red Sea.—Captain Nares and the officers of H.M.S. *Newport* have been employed during the last summer in prosecuting the survey of the coasts of Sicily and the coral-banks between it and the coast of Tunis; a suitable channel was described south of the Skerki reef, through which the telegraph-cables connecting Gibraltar and Malta, and the latter with Bona, have been successfully laid.

In consequence of the increased traffic through the Red Sea since the construction of the Suez Canal, a resurvey of the Gulf of Suez became necessary, and the *Newport* was detached from the Mediterranean on this service in September, since which time the survey has been vigorously prosecuted in the face of many difficulties: very considerable progress has already been made, and the ship is about to return, until the cool season again sets in, when she will be replaced by a vessel more suited to cope with the weather and the climate of the Red Sea.

In compliance with a request from the Indian Government that a resurvey should be made of the port of Aden, previous to the dredging operations about to be undertaken for increasing its capabilities, Navigating-Lieutenant Ellis was sent from England in October to carry out this service, which has been satisfactorily completed.

West Indies.—Navigating-Lieutenant George Stanley has succeeded Staff-Commander Parsons in the conduct of this survey, and has been employed during the past season, with one assistant, in extending the survey of Demerara, which was commenced in September, 1869.

The approaches to the Rivers Demerara and Essequibo, with the adjacent coast, having been completed, the surveyors have lately been employed in obtaining off-shore soundings on the extensive bank which fronts British Guyana, an operation of a very arduous and tedious character, in the small sailing-vessel at their disposal.

Newfoundland.—This survey is conducted by Staff-Commander J. H. Kerr, aided by two assistants, and is carried on during the summer season in a small hired steam vessel. A portion of the last season was devoted to sounding the eastern approach to Belle Isle Strait, when the limit of the 100-fathom edge of the bank was well defined, in the interest of the line of passenger-vessels which run between Liverpool and Quebec, and adopt this route during a part

of the year. The fogs which are so prevalent on this dangerous coast, and which, in addition to the presence of ice, enhance the difficulties of navigation, give an increased value to these soundings as a guide to the mariner: with the same view, depths have been obtained on the hitherto blank spaces in the charts of the Gulf of St. Lawrence. During the latter part of the season, the surveyor were engaged in defining and charting the numerous dangers in the neighbourhood of Bonavista Bay, on the eastern coast of Newfoundland.

In the depth of winter, Commander Kerr and his assistant aided in several attempts to recover the broken Atlantic cable, but, owing to a constant succession of storms, intense cold, and the prevalence of ice, their efforts were unsuccessful.

British Columbia.—Staff-Commander Pender and his two assistants have been employed during the past season in examining the rugged western seaboard of the islands which front the coast of British Columbia, northward of Vancouver Island; which have been completed, as well as the inner and sheltered ship-channels of communication, as far as the northern boundary of the colony, in $54^{\circ} 40'$ N. lat. Additional soundings have also been obtained on the bar at the entrance of the Goletas Channel, at the north end of Vancouver Island, and resurveys, on a large scale, of Beecher and Pedder bays, at the eastern end of St. Juan de Fuca Strait. This survey may now be considered complete, and sufficient to meet all the requirements of the navigator and the settler for many years to come, and the party have been consequently withdrawn.

Cape of Good Hope.—During the past year this survey, under the conduct of Navigating-Lieutenant Archdeacon, has made excellent progress: the coast has been completed from Lambert Bay, northward, to a few miles beyond the Orange River, a distance of about 250 miles, although, from the want of a vessel, it has not yet been possible to complete the soundings off it.

Great hopes were entertained that the entrance to the Orange River would have proved navigable, thus opening up a new and shorter route to the lately-discovered diamond fields: such hopes, however, were not realised, the entrance having been found obstructed by an extensive sandbar, and the river within, for several miles, a mass of sandbanks.

A survey, however, of Port Nolloth, about 50 miles to the southward, has been executed. It is a small, but very safe harbour for vessels of light draught, and is becoming of considerable importance

to the colony as a port of shipment for the copper-ore obtained from the mines which are situated about 90 miles from the coast. "Great credit," Mr. Archdeacon remarks, "is due to the Copper-mining Company for the energetic manner in which they are carrying out works for developing the mineral wealth of this otherwise unproductive tract of country: a steam tramway is in course of construction from the port to the mines, 40 miles of which were completed and in working order at the end of December."

This surveying party has undergone considerable hardships and privations, consequent on the scarcity and extreme saltiness of the water, and the almost entire absence of inhabitants in the vicinity of the coast, where the country is little better than a barren sandy waste.

South Australia.—During the early months of 1870, Navigating-Lieutenant Howard and his assistant were employed in a small colonial schooner in sounding the neighbourhood of Tipara Reef in Spencer Gulf, and examining the Northern Coast of Kangaroo Island, between Point Marsden to Cape Borda, a distance of over 50 miles.

Subsequently the coast was surveyed from the mouth of the Murray River to Cape Jaffa, 40 miles south of Lacopede Bay. Mr. Howard remarks of this bay that, although quite open to the westward, it is remarkable as a perfectly smooth anchorage; the swell from the Southern Ocean being entirely broken up and dissipated by the time it reaches within a mile of the beach, in four fathoms of water, even in the most violent gales. This circumstance he attributes to the very gentle undulation of the bottom, and the consequent very gradual shoaling of the water from about 10 miles off-shore up to the beach.

Later in the season the coast line was completed from Cape Jaffa to Glenelg River, making altogether a distance of about 230 miles of coast examined during the year: the greater part of this, owing to the impossibility of effecting a landing from boats, was carried out by shore parties, and the off-shore soundings still remain to be completed: on this work the surveyors are at present employed.

Victoria, Australia.—Navigating-Lieutenant H. I. Stanley, aided by two assistants, has completed the line of coast known as the Ninety Mile beach or Gipps' Land, and carried the survey eastward to Cape Everard, a point about 40 miles from Cape Howe, the eastern limit of the colony. The greater part of this stretch of coast is uninhabited; and, as a landing could not be effected with safety, it

became necessary to carry on the survey by walking parties, crossing the rivers on rafts constructed of drift timber. In this manner, and in the face of many difficulties and privations, among them the absence of fresh provisions, 120 miles of coast were surveyed in less than three months, and conspicuous beacons erected for fixing the positions of the soundings still to be obtained. In addition to the above, large-scale plans have been made of Port Fairy and Warrnambool Harbour.

The coast has been closely sounded, from Wilson Promontory to near Merriman Creek, on the Ninety Mile beach, amounting in measurement to about 400 square miles. The total amount of coast surveyed by this party during the year has been 180 miles, the greater part of which was open and exposed.

New South Wales.—It was noticed in the last annual report that the seaboard of this colony, together with the off-shore soundings, had been completed; the charts of the whole coast have since been published, and reflect the highest credit on all the officers who have been engaged in this excellent survey. Navigating-Lieutenant Gowlland, who, in succession to Captain Sidney (the officer who commenced and conducted the survey for several years), has brought it to a close, has been retained for a time in the colony by permission of the Admiralty, for the purpose of completing the inner waters, and has lately finished the survey of Clarence River.

Queensland.—Staff-Commander Bedwell, who is in charge of this survey, has, with one assistant, in a small colonial vessel, carefully examined and surveyed the shores of the colony from the northern part of Hervey Bay almost to Port Curtis, a distance of about 140 miles; and this stretch of coast has been closely sounded to a distance of twenty-five miles off-shore.

Eastern Archipelago.—Under this designation are included the Sulu Sea and the channels among the Philippine Islands leading eastward into the Pacific Ocean—the passages southward into the Sea of Celebes, the Moluccas—and Banda and Arafura seas towards Australia. It must be acknowledged that the term is sufficiently comprehensive, and the information which we possess regarding it as a navigable region is at present extremely imperfect. Looking to the prospect of an extensive commercial intercourse springing up between China, Japan, and the Australian colonies by these routes, the work has scarcely been commenced too soon.

H.M.S. Nassau, under the command of Commander W. Chimmo, was fitted out last year, and left England in May to commence this

great work. The ship passed through the Suez Canal and Red Sea, making an examination there, of various sites proposed for light-houses; she then carried a line of deep-sea soundings, in depths varying from 2000 to 3000 fathoms, between Galle Harbour in Ceylon and Java Head at the entrance of Sunda Strait, and thence up the China Sea to Hong-Kong, for submarine-cable purposes, finally leaving Hong-Kong for the scene of her work early in December; by the last accounts she had commenced her labours in the Sulu Sea.

Japan.—Commander St. John and the officers of H.M.S. *Sylvia* have been principally employed during the past year in making surveys of the intricate portions of the Inland Sea of Japan, which were most urgently required. They have completed the passages on either side of the "Conqueror" Bank, from Cone Island on the east to Mutsu Sima on the west, a distance of about 20 miles; and when this very important part of the navigation of what is now rapidly becoming a great thoroughfare, is published, it cannot fail to be a great boon to the seamen of all nations, and the navigation of the Inland Sea, throughout its whole length, about 250 miles, will then be an operation of comparative ease and safety.

The ports of Matoya and Owasi, on the south coast of Nipon, have also been surveyed, and will prove valuable as harbours of refuge, for vessels caught in bad weather between the eastern entrance of the Inland Sea and the Gulf of Yedo.

Commander St. John has furnished some very valuable observations on the great Japan Current, and on the Typhoons, which prevail in this region, and acknowledges the valuable assistance which has been rendered to him in these researches by the intelligent Commanders of the Peninsular and Oriental Company's ships, running between China and Yokohama. It is gratifying to relate, in connexion with this survey, the very great interest which has been manifested in the work by the Government of Japan: everywhere the greatest possible attention and civility have been extended to the surveying parties, and assistance in the way of guides, interpreters, &c., freely afforded.

At the request of their Government, some young Japanese officers were received on board the *Sylvia*, and instructed in the art of nautical surveying and the use of instruments; acquitting themselves very creditably. A small steam vessel has also been placed at the disposal of Commander St. John, for the purpose of co-operating in the survey; and it seems not improbable that at no distant

time the Japanese may take up the Nautical Survey of their own coasts, or at any rate materially contribute towards its completion.

In closing these brief notices of the progress of the Surveys of the Eastern Seas, which it has been the policy of this country to pursue ever since our commercial relations with China were seriously established subsequent to the war of 1841, it is impossible not to reflect on the vast benefits which accrue, in consequence, to the commercial interests of all nations, but especially to our own, and at an expense to the country of very little more than the ordinary annual cost of two of the smallest class of vessels of war.

Summary.—The usual Tide Tables, lists of Lights, Hydrographic Notices, and Warnings to Mariners, have been issued during the past year. Of Sailing Directions there have been published a volume for the West Coast of England, from Milford Haven to the Mull of Galloway; revisions of the Channel Pilot, relating to the North Coast of France and the Channel Islands, and also of the Persian Gulf Directory. New directions have likewise been prepared for the navigation of Magellan Strait and the northern channels; the result of the late survey.

Forty new charts have been engraved and published, and over one thousand added to or corrected. Among the former may be noticed, as of especial importance to navigators, a new series of the North and South Atlantic Oceans in four sheets, and of the Indian Ocean in two sheets, on scales coinciding with the Pacific series previously in circulation; an entirely new series for the Strait of Magellan, embracing from Cape Virgin, on the east, to Cape Pillar and the Gulf of Penas on the west and north: these latter charts, on good navigable scales, are principally the results of the labours of the late Admiralty Survey under Capt. Mayne, C.B.; they amount to seven sheets, exclusive of numerous separate plans of anchorages; and there is no reason now why the largest steamers, with the assistance of these charts and directions, should not avail themselves of the smooth-water route, and enter the Pacific from the Gulf of Penas in the latitude of 47° S. Lastly, it must not be omitted to notice a new Magnetic Chart of the World, just published from materials collected at the Admiralty since 1858, the date of the last chart of the kind, prepared by Captain Evans, R.N. Owing to extended magnetic observations in various parts of the world, and to the changing character of the elements of which this chart is composed, it is important that it should be renewed at certain intervals of years.

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The present publication has been compiled by Navigating-Lieut. Creak, of the Hydrographic Department.

The number of Admiralty Charts printed for the use of Her Majesty's ships and the public generally, during the last year, has been one hundred and fifty-three thousand.

NEW PUBLICATIONS.—*Colonel H. Yule's edition of 'Marco Polo.'*—Whilst these pages are passing through the press, I have received an early copy of a work—a new edition of 'Marco Polo'—which, by the profound erudition it displays on all topics relating to the mediæval geography of Central and Eastern Asia, merits prominent notice in an Address like the present. Colonel Yule, indeed, by his previous work, 'Cathay, and the Way Thither,' noticed in my Address of 1867,* had shown himself thoroughly competent for the great work which he has now, after many years' labour, brought to a conclusion.

The maps, 17 in number, with which the two handsome volumes—in addition to 90 pictorial engravings—are illustrated, give a geographical character to the book at the first glance. Six of these maps are devoted to the elucidation of the itineraries of Marco Polo, and one is intended to embody his own conception of the geography of his route, being constructed, as far as possible, on his own corrected data and expressions. Among the others is a Plan of modern Peking and its environs, overlaid by another showing the city as it stood about the year 1290, when described by Marco Polo under the name of Cambeluc; besides plans of Hangchow, the Traveller's "Great City of Kinsay," with its lake; the remains of the Great Mongol City of Sarai, on the Volga; and so forth. The pictorial illustrations, also, are well selected, and often convey vivid ideas of the places and subjects described by the mediæval Traveller. Such is the one representing the Paizah, or Honorary Golden Tablets of the Mongols, to which Marco Polo so often alludes; and such also is the restoration of the ancient city of Pagán, in Burma, the *Mien* of the quaint Venetian Traveller, as compiled from Colonel Yule's own sketches on the spot. The carefully-studied illustrations of the Mongol camps of the Middle Ages, of the Chinese fleets, and of the Mediterranean galleys of the same period, as well as the representations of the aborigines of Western China, after Chinese drawings, are all of

* 'Journal,' vol. 37, p. cxxxi.

the same instructive character. In short, the reader will derive no little aid, in enabling him to realise the full meaning of the mediæval Traveller's descriptions and narrative, from the copious illustrations which enrich this remarkable book.

With regard to the Editor's part in the work itself, it may be observed that the Preliminary Discourse on the Life and Book of Marco Polo introduces a variety of documents from the Venetian Archives, of which some, such as the great Traveller's will, have not been before published in England, and others are entirely new. Among the latter may be noted the record of a case before the Venetian Court of Requests, in which Marco Polo prosecutes an unfaithful agent, who had been entrusted by him with the sale of a parcel of musk, the first document known in which Marco appears as an actual trader. The different texts of the Traveller's book, their sources, mutual relations, and comparative value, are made the subject of a discussion, which is illustrated by Tables, showing the filiation of the different manuscripts, as deduced by Colonel Yule; and a list of the known MSS., amounting in number to 75. It may be added, as a striking proof of the amount of original research made by Colonel Yule, that this number exceeds by nearly 30 the fullest list hitherto compiled; and that 27 of the whole number have been actually examined by him.

A task such as the elucidation of the many obscure points in the narrative of Marco Polo could not, as the Editor modestly observes in his Preface, have been satisfactorily accomplished by the resources of any one person. The force of this remark will be evident, when it is considered that not only a knowledge of the written language, history, and archæology of China and other countries of Asia is absolutely necessary, but an acquaintance with various recondite branches of science, and personal acquaintance with the topography of portions of the vast countries over which Marco Polo's travels extended. The sagacity and industry of Colonel Yule have, however, served him well in seeking and obtaining valuable aid from many authorities on special subjects. Among many others to whom he acknowledges his indebtedness, may be named the Cavaliere Gulielmo Berchet, of Venice; Dr. William Lockhart, formerly Resident in Peking; one of our medallists of last year, Lieutenant Francis Garner; Major Montgomerie, of the Indian Trigonometrical Survey; the Rev. Dr. Caldwell, author of the 'Dravidian Comparative Grammar'; Mr. A. Wylie, of Shanghai, the eminent Sinologist; the Rev. H. A. Jaeschke, of the Moravian

Mission in British Tibet; Pundit Manphul, C.C.I., lately British Agent in Badakhshan; Colonel Lewis Pelly, H.M. Resident on the Persian Gulf; Professor Schiefner, of the Imperial Academy of St. Petersburg; Sir Arthur Phayre; Sir Bartle Frere; and Professor Vámbéry.

Among the new geographical elucidations contained in the work, some of which are, to the great convenience of the reader, pointed out in the Preface, are the following:—The explanation of the name *Gheluchelan*, applied by Polo to the Caspian (I. p. 55); a detailed discussion, with a map, of the route between Kerman and Hormuz; and the identification, for the first time (by the aid of Colonel Pelly), of the site of the older Hormuz, on the mainland (I. p. 104–108); the identification of Polo's *Cobinan* with the still-subsisting district of *Koh-Bendán*, in northern Kerman (I. p. 117); the establishment, by the aid of Pundit Manphul, of the position and continued existence of Keshm, in Badakhshan, the *Casem* of Polo, a place which had disappeared from modern geography (I. p. 147); the identification, by the aid of Dr. Caldwell, of the site and ruins of the great port of *Cail*, in Tinnevely (II. p. 307); and many others of similar interest and importance.

Italy.—A remarkable revival of interest in Geographical enterprise has of late been displayed in Italy, the birth-place of so many renowned travellers and discoverers. The Italian Geographical Society, to which I have alluded in former Addresses, as presided over by the energetic Chevalier Cristoforo Negri, now comprises no fewer than 1254 members, as I learn from the Anniversary Address of the President, delivered at Florence on the 30th of April last. This Address, occupying fifty-five pages of large octavo size, is a comprehensive review of the progress of Geographical science and discovery during the year, and shows how closely its learned author has followed the achievements of travellers and the records of Geographical research in all countries. It is apparent from Signor Negri's observations that he is anxious to secure the co-operation of all those distinguished Italians who are engaged in exploration, under foreign Governments, and the results of whose labours have hitherto been published in other languages than their own. By gathering these within the fold of the Society of their mother country, great results may in future be anticipated. Even at present, the *Bollettino* of the Society, issued in annual volumes, contains many valuable original memoirs and maps, which all geographers will do

well to consult. During the past year the Society has received the Reports of Nachtigal's Expedition to the Sultan of Bornou, to which an Italian gentleman, Signor Valperga, is attached. The expedition intended to return by the dangerous route of Waday, where the unfortunate Vogel was murdered.

Switzerland.—From our indefatigable Corresponding Member, M. J. M. Ziegler, of Winterthur, we have received the usual annual Report of the progress made in perfecting the topography, geology, and climatology of Switzerland. By this we learn that the Geodetical Board have continued their operations since the last Report, and that Professor Hirsch has announced that the determinations of longitude will be concluded during the present year. We also learn that the Federal Government, in addition to the superb maps of Switzerland they had previously given to the world—the work of the Federal Ordnance Survey—have issued a new set of contoured maps of portions of the country, namely, the environs of Berne and of Interlachen, on scales of 1 : 25,000 and 1 : 50,000. The Surveys of Switzerland, supported by the Federal Government, tend gradually to render the knowledge of the topography and physical geography of this diversified portion of Europe as complete as possible. Thus, a cadastral survey of all the 132 municipalities of the Canton of Soleure is now in course of execution, under the direction of M. H. Denzler, on a scale of 1 : 500 and 1 : 1000.

UNITED STATES.—The American Geographical and Statistical Society of New York, which is destined, no doubt, to play an important part in the promotion of Geographical science, numbered, in the early part of the present year, 540 members. At the annual meeting, on the 20th of February last, an interesting general report on the geographical work of the United States for the past ten years was read by Professor Gilman, under the form of the annual Address to the Society. In this comprehensive discourse the numerous Expeditions which have been organized to survey the vast Western Territories of the States were briefly passed in review. The scientific results of some of these, published with rare completeness and at liberal outlay by the United States Government, are well known in England; others, such as the publications of the Geological Survey of California, are much less known, although of the highest general and scientific interest. This Survey, chiefly under the direction of Whitney, has examined the range of the Sierra Nevada of California, measuring its lofty peaks

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and mapping out on a large scale the many picturesque valleys lying along their flanks. We now learn that a map is nearly ready for publication, giving the results of these surveys, as far as regards the central part of the State, in which the highest peaks of the country are situated. But more than this, a series of elaborate volumes is in course of preparation (three of which are already issued), devoted to the Geology, Physical Geography, Botany, and Zoology of California. When we consider that the cost of all this is defrayed by the State Government, and voted by the State Congress, we cannot but admire the enlightened public spirit thus displayed by the citizens of the "Golden State;" and our admiration is increased on learning that some portions of the country, especially those picturesque tracts where groves of the gigantic cedars are still growing, have been reserved by the State, in perpetuity, as vast parks for the enjoyment of the people.

Besides the noble work just mentioned, there are enumerated in Professor Gilman's discourse, among recent operations, the official survey of the country adjacent to the 40th parallel, under Mr. Clarence King, which includes an accurate topographical examination of a belt adjacent to the Central Pacific Railroad, with researches in its geology, botany, and so forth; and the surveys, by different parties, viz., Parry and Englemann, Gilpin, and Whitney and Brewer, of the peaks and so-called parks of Colorado Territory, comprising the central part of the Rocky Mountain system. An account is given also of a party sent by the Harvard Mining School, by whom a survey has been made of the loftiest portion of Colorado, the results of which have not yet been published. It has now been established that the three highest peaks in United States territory are Mount Whitney in California, and Mounts Harvard and Yale in Colorado, none much exceeding 15,000 feet above the sea-level. Other surveys have been—that of Arizona, by Mr. J. T. Gardner, the Utah Boundary Survey, Major Williamson's measurement of the depression below the sea-surface of Death's Valley, in the southern part of the Great Basin, and particularly the remarkable examination of the Great Cañon of the Colorado River, made by Major Powell during a courageous journey through this stupendous chasm. The interest excited by these surveys is creating in the States a demand for a national topographical and trigonometrical survey, similar to those of many European countries, which assuredly will not be much longer delayed.

It is scarcely necessary in this place to point out the great im-

portance of these works to all engaged in geographical pursuits. The Cartographer, indeed, both in the United States and in Europe, will readily adopt the great mass of new information supplied by these surveys, and register them on new maps for public use; but the Physical Geographer should not be unmindful of the great addition to the illustrations of his science which these explorations in the western parts of North America are calculated to furnish, undertaken, as they have been, over a portion of the world in a high degree remarkable for the variety and singularity of its physical configuration.

INDIA.—A Memoir on the Indian Surveys, by Mr. Clements Markham, has been printed by order of the Secretary of State for India, which is intended to furnish a history of the scientific surveys from their first commencement. The narrative is supplied with numerous references, in order to enable an inquirer to follow up his researches on any special point, or on any particular branch of the subject. It is thus a work the perusal of which will give a comprehensive idea of the measures that have been taken in India for the advancement of geography and kindred sciences, while it is also intended to be permanently useful as a book of reference. The Memoir is divided into seventeen sections. The first gives a history of the marine surveys conducted by officers of the Indian Navy, and is an interesting record of operations which have added very largely to our geographical knowledge. I need only refer, in proof of this, to the numerous important papers in our 'Journals,' and in those of the Bombay Geographical Society, by officers of the Indian Navy; all of which are noticed in this section of Mr. Markham's Memoir. The first surveys on land were not commenced until Lord Clive had won the battle of Plassy; when that great geographer Major Rennell commenced his honourable career by mapping the districts of Bengal and Behar. The second Section of the Memoir contains an account of the route-surveys of Rennell and his coadjutors in various parts of India. In the commencement of the present century, the system of route-surveying was superseded by the more scientific trigonometrical method introduced by Colonel Lambton. The eight following Sections of the Memoir contain a narrative of the labours of Lambton, Everest, Waugh, Thuillier and Walker, and of the distinguished officers who have served under them. This ground is covered by the measurement of the great Indian arc of a meridian, commenced by

Lambton, and successfully completed by Everest ; by the operations of the Great Trigonometrical Survey, and by the work of the Topographical and Revenue Surveys. Here we have a record of work conducted with great scientific knowledge, with marvellous skill and judgment, and with untiring zeal ; through which results have been obtained that are unsurpassed, for magnitude and importance, in any other part of the world. Hitherto the history of these most interesting operations has been buried in official reports, which are not easily accessible ; and a complete general view of them, in a convenient form, such as is supplied by these sections of Mr. Markham's Memoir, cannot fail to be welcome to all geographers. In his 12th Section, Mr. Markham gives some account of the method of supplying instruments for the use of the scientific surveys in India, and of the observatory established at Lambeth, under the direction of Colonel Strange, for testing and examining them.

The subsequent Sections of the Memoir review the operations of the scientific labourers in those other branches of inquiry, which are included under the head of Geography in its most comprehensive sense. The 13th Section gives a history of the Geological Survey of India, as well as some account of the earlier labours of zealous independent inquirers before a systematic survey was established. Then follows a section on Archæological Researches in India, containing a general view of the work of James Prinsep, Wilson, Cunningham, Fergusson, Meadows Taylor, Walter Elliot, and other eminent men who have laboured in this important field of inquiry. A perusal of the Archæological Section of the Memoir will furnish very striking evidence of the close connexion between geography and the investigations of the archæologist. The identification of sites of ancient cities, and a comparison of their present position with the positions described in ancient writings, supplies proofs of physical changes, especially as regards the courses of rivers. Indeed comparative geography, which is not the least important branch of our science, is wholly dependent on the labours of archæologists. The next Section gives a detailed account of the meteorological and tidal observations that have been undertaken, from time to time, in various parts of India ; of the valuable contributions to our knowledge of Indian meteorology by Colonel Sykes, General Boileau, Dr. Buist, Mr. Allan Broun, and others, and of the systematic arrangements for meteorological registration which have recently been adopted by the Indian Government. In his 16th Section, Mr. Markham records the labours of astro-

nomers in India. First touching upon the ancient studies of Ulugh Beg, and the later observations of the renowned Jye Sing, a sketch is then given of the work accomplished by the English successors of those Oriental astronomers, at the Madras Observatory, under Goldingham, Taylor, Jacob, and Pogson; and at Trivanderum under Caldecott and Allan Broun.

The 17th Section is devoted to physical geography, and to an attempt to supply information respecting the efforts that have been made to form generalizations from the observations collected by surveyors and other inquirers. Mr. Markham here enumerates the opinions which have been formed by geographers respecting the physical structure of the great Himalayan mass, the views entertained with reference to the river-systems, and the accounts that have been published of the physical features of other parts of India. He also gives an account of the labours of botanists, and supplies references to works on forest conservancy, and other results of human action, which have so important a bearing on the physical changes of the earth's surface.

Mr. Markham devotes a final Section to a history of the utilization of the work of the surveyors, and of the preparation and publication of maps, from the time of Richard Hakluyt, the first cosmographer to the East India Company. He reviews the labours of Rennell, Dalrymple, Horsburgh, Aaron Arrowsmith, and John Walker; and gives information respecting the preparation of the Indian Atlas, of the charts of Indian seas, and of other maps and memoirs. Mr. Markham is now himself in charge of the Geographical Department of the India Office; and it is a source of great satisfaction to find that care is at last being bestowed on the priceless collection of geographical documents which have been inherited from the old East India Company. The importance of having a Department in England, in communication with the surveyors and other scientific inquirers in India, has long been felt; and it is certainly a cause for congratulation among geographers that an arrangement should have been made which, while ensuring the efficient transaction of business connected with the Indian surveys, will also have the effect of securing a more general diffusion of knowledge in England respecting the noble and zealous labours of our brother geographers in the East.

The operations of the Surveys in India, during the last season, 1869-70, show steady progress, and have resulted in the production of a large number of useful maps, and of considerable additions to

geographical knowledge. Mr. Markham's memoir will enable geographers to refer to the previous history of operations now in progress; and, in reviewing the work of the Indian Surveys during the last season, I will therefore take them in the same order as has been adopted in the sections of his memoir.

Indian Marine Surveys.—Since the abolition of the Indian Navy, in 1862, no fresh marine surveys have been undertaken. This is the more to be deplored, as a great deal of very important work remained unfinished, while the surveys of many parts of the Indian coasts urgently require periodical revision. Mr. Markham has recently brought this subject to the notice of the Secretary of State for India; and I am glad to learn, from a statement made by Mr. Grant Duff, in the House of Commons, that its consideration has been referred to our Associate, Governor-General the Earl of Mayo.

The Great Trigonometrical Survey.—This great work, under the superintendence of Colonel Walker, is now approaching completion. Five trigonometrical Series are still in hand. The Brahmaputra Series, on the 90th meridian, under Captain Thuillier, has been pushed forward 56 miles during the last season. It follows the course of the Jamoona branch of the Brahmaputra, passing through a flat country, much cut up by watercourses. The operations of the Burmah Series, under Mr. Rossenrode, were, unfortunately, brought to a sudden stop, owing to the financial panic of last year. The Beder Longitudinal Series is to connect the Great Arc with the Coast Series. It passes through a most difficult and pestiferous region, chiefly in the basin of the Godavery. The work was undertaken by Sir George Everest, when quite a young man, nearly fifty years ago; but he and his whole party were struck down by malignant fever, and they were obliged to abandon the attempt. The country has scarcely been visited since, and has never been mapped. It is densely wooded, and thirty-two hill-tops had to be cleared of forest for observing-stations. Mr. Shelverton, who was in charge of this Series, during the season of 1869-70, carried the triangulation over 70 miles, and extended the preliminary work for 170 miles further. But he, like Everest, was struck down by fever, with most of his party, and five of his men died. Having partially recovered, Mr. Shelverton nobly stuck to his work, with that devoted zeal which has ever distinguished the members of the Indian Surveys; and the melancholy news has now arrived that he has died at his post, a true martyr to science. He had been many years in the Survey, and had done much valuable

service, which has been fully acknowledged in the reports of his chiefs. He was an admirable surveyor, and a man of undaunted courage and zeal. His loss will be much felt. The Belaspur Series, on the meridian of 82° , has been commenced by Mr. Keelan, and was extended for 95 miles during the last season. The Bangalore Meridian Series is intended to cover the ground of Colonel Lambton's original work, from Cape Comorin to the Beder base, which, in consequence of improved instruments and the more accurate methods of modern times, now requires revision. The Series is divided into two Sections, under Lieut. Rogers and Major Branfill.

The topographical surveys, under the superintendence of Colonel Walker, include those of Kumaon and British Gurhwal, Kattiwar, and Guzerat. The first, directed by Major Montgomerie, shows a very large out-turn of work; while that officer's highly interesting report on the journey of the Mirza—the native whom he instructed and selected for the extensive journey over countries unvisited by Europeans since the days of Marco Polo and Benedict Goes—is fully noticed in my narrative of the progress of discovery in Central Asia. I must not omit, however, to mention here the work of Captain Carter, in fixing the positions of many peaks in the mountainous country north of Peshawur. The Kattiwar Survey, under the thoughtful and judicious supervision of Lieut. Trotter, has made good progress, and a large area on the western shore of the Gulf of Cambay is completed. The Survey of Guzerat, under Major Nasmyth, was commenced during the season of 1869-70.

Two astronomical parties, on the meridians of 75° and 78° , have been at work, under Captains Heaviside and Herschel. The former took sets of observations at five stations between the parallels of Indore and Poona; while the latter took sets of observations at two groups, consisting of three stations each,—one near Bangalore, and the other at Coimbatore. The results, at several stations of a group, serve to show whether there is any essential local deflection. Such was found in both groups. Lieut. Herschel used the zenith-sector, recently completed by Messrs. Troughton and Simms, from designs by Colonel Strange, on which he reports very favourably.

The levelling operations of the Survey, conducted by Mr. Lane, covered a circuit of 570 miles in Oude and the North-West Provinces, during the past season, and the discrepancy at closing only amounted to 0.14 of a foot.

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In the season of 1868-69 Major Basevi completed his series of pendulum observations on the great meridional arc of India. In 1869-70 he took observations on points on the coast, in nearly the same latitudes as the pendulum stations inland. He selected positions far from mountain ranges, that the results might not be affected by such variations of gravity as are met with in the vicinity of high land. A series of observations was also taken on the Island of Minicoy; and Major Basevi intends to observe on the elevated plateaux of Ladak and Tibet, at Aden and in Egypt on his way home, and to bring the work to a close by a series taken at Greenwich. His observations of last season were calculated to throw some light on the relative variations of gravity at continental, coast, and ocean stations. The results show that gravity on the coast is greater than inland, and at ocean stations greater than on the coast.

At the computing office of the Great Trigonometrical Survey, Mr. Hennessey and Mr. Cole have re-determined the thermal expansion of the standard bar, by very careful and exact investigations, which entailed much labour. An accurate knowledge of the factor of expansion of the standard bar was the one thing wanting to permit the final reductions of the base lines, and these reductions have now been completed. Colonel Walker has thus been enabled to commence the publication of the final results of the Survey; and his first volume has just appeared. It contains a very interesting introductory account of the early operations of the Survey from 1800 to 1830, and the details of operations connected with the base lines and the standard of measurement. The whole work, consisting of some twenty volumes, will form a complete history of the Great Trigonometrical Survey of India.

The Revenue Surveys of India, divided into the Upper and Lower Circles, have been actively prosecuted; and 21,054 square miles have been surveyed during the season of 1869-70. The Upper Circle comprises two parties in the North-West Provinces, one in Oude, two in the Punjab, one in Sind, and four in the Central Provinces. The Peshawur Survey, embracing 2467 square miles, under Colonel Johnstone, was commenced in 1863. Much valuable work has been done beyond the frontier, and several errors have been discovered in the old maps, especially one in the course of the Cabul River. Colonel Johnstone made friends with the wild hill-tribes, a race of plunderers, like our own Borderers three centuries ago. One of the Afreedees chanced to see the Colonel's crest—the *winged spur*—and, on asking its meaning, he was told the well-

known Border story, which rejoiced his heart. Henceforth there was a fellow feeling for the Sahib whose Border ancestors had the same pursuits as the Afreedees. In Nemar, the maps of the surveyors were of great use to the railway engineers in their preliminary operations. They were saved the necessity of making surveys of their own, which expedited their work materially. The Lower Circle comprises surveying parties in Nowgong, Luckimpore, Hooghley, Cooch Behar, Hazareebagh, and Seebsaugor. The work of the Madras Revenue Survey is also progressing, and the village and district maps form the basis for the future construction of useful maps on smaller scales.

The Topographical Surveys of India are undertaken to furnish all the details required for good military maps, and for engineering and other administrative purposes, in Native States, or in the hilly and thinly-populated regions where elaborate field-surveys are unnecessary. India is too large and diversified to be dealt with by one system of survey only; and Colonel Thuillier, who has now been in charge of the Revenue and Topographical Surveys for upwards of a quarter of a century, has pushed forward two systems side by side, each admirably adapted for the special requirements of the region to which it is applied. During the season of 1869-70 seven topographical surveying parties have been at work in Gwalior and Central India, the Central Provinces, Chota Nagpore, Ganjam, Bundelcund, Rajpootana, and the Khasia and Garrow hills. All these regions were previously either unmapped or represented only by very old imperfect sketches. They are for the most part wild and extremely unhealthy, and labour is procured with much difficulty. The total work includes 16,315 square miles surveyed, and 13,218 of advanced skeleton triangulation; and much material has thus been furnished for several of the unfinished atlas sheets. In the Central Provinces, the party commanded by Mr. Girdlestone was at work in the loftiest and wildest parts of the Satpoora range, and in the malarious forests near the Wyngunga valley. The party had been employed for sixteen years in this wild region, and had mapped 26,580 square miles. Colonel Saxton's party was employed in finishing the Saora hills, within the Ganjam Agency, which are inhabited by tribes who had never before allowed strangers to enter their country. The party under Lieutenant Sale, in Chota Nagpore, explored the extremely interesting region which forms the water-parting between the valleys of the Sone and Nerbudda. Lieutenant Sale himself suffered from an attack of malarious fever. The survey

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of the Khasia and Garrow hills, which had hitherto been conducted by our associate Major Godwin Austen, was, after his departure on leave, entrusted to Captain A. B. Melville, the news of whose melancholy death has just been received.

Colonel Thuillier is year by year increasing the usefulness of his office, by the issue of excellent compiled maps, and by the rapid preparation of maps of the recently surveyed districts. In the last year no less than 24,558 maps were issued to government officials and local agents from the Surveyor-General's Office at Calcutta. In the photographic branch Colonel Thuillier is ably and zealously assisted by Lieutenant Waterhouse, and 60,116 copies of phot zincographed maps were struck off during the year. But the great achievement of the season has been the publication of two quarter sheets of the Indian Atlas. In 1868 it was resolved that this work should be completed in India; and Colonel Thuillier made the necessary arrangements, and took skilled engravers out to Calcutta with him, on his return early in 1869. Mr. Coard is the superintendent of the engravers. The sheets now published at Calcutta are No. 87 s.w., which includes Lucknow, and No. 125 s.e., being a part of Sylhet. They will lose nothing by comparison with the engraved sheets produced in England. Mr. Coard has also devoted much of his time to training native engravers; and the young apprentices have made rapid progress in writing, and even in the more difficult process of hill etching. The advantages of engraving the sheets on the spot, where there can be immediate reference to the surveyors themselves and to the original documents, are sufficiently evident; and we may look forward to very excellent results from the remaining sheets of the atlas being prepared and engraved under the able supervision of Colonel Thuillier himself.

The Geological Survey of India.—The intrepid geologists, who are doing such excellent service under the leadership of Dr. Oldham, have visited many wild unexplored regions in India, and their valuable memoirs and reports have added very largely to our geographical knowledge. During the season of 1869-70, Mr. H. B. Medlicott has revised the geological maps of the Jhansi and Sangor districts, Mr. Ball revised the maps of the Rajmehal hills, Mr. Hacket explored the Jubbulpore country, and Mr. Ormsby, after completing a revision of a large portion of the Bhaugalpore district, added one more to the long list of men of science who have fallen victims to the Indian climate. Mr. Mallet reported on the geological structure of Aden, with a view to determining whether the

principle of Artesian wells could be applied there with any prospect of success. In Madras, Mr. Foote has been engaged in geologically mapping the valley of the Upper Kistna, to determine, on the one side, the outline of the great Deccan trap-rocks, which have overflowed all the other formations, and, on the other, to fix the boundary of the immense area of fundamental gneissic rocks. Mr. Blanford, who did such good service in Abyssinia, has been engaged in examining the coal-fields of Bilashur and the Nerbudda valley, and a valuable lead-vein at Chicholi, near Raipur. Mr. Hughes has explored the great coal-field of the Wurda valley, and has shown much judgment and skill in selecting localities for boring, while Mr. Fedden was mapping the area covered by trap-rocks, to fix their boundaries in the vicinity of the coal-measures. The operations of these zealous geologists have been recorded in memoirs, which also contain so much important geographical information that they call for special notice here. I am glad to find, from Dr. Oldham's last Report, that materials are now complete for the publication of several final geological maps.

The Archaeological Survey of India.—Systematic archæological investigations, under the supervision of General Cunningham, who only left England last December, will commence in the ensuing season; and all previous work of this kind is noticed in the section of Mr. Markham's memoir which is devoted to this subject. But I cannot omit a notice of General Cunningham's first volume of his 'Ancient Geography of India,'—a very important work, which embodies some of the results of his previous antiquarian researches. In this volume, General Cunningham follows the routes of Alexander the Great, and of the Chinese pilgrim Huen Thsang; identifying the sites of several important cities and sacred spots. These identifications illustrate the changes that have taken place in the courses of the Punjab rivers, and of the Indus, and the extraordinary alteration of the whole region between the Sutlej and the Jumna. The work is a most valuable contribution to our knowledge of the ancient geography of India, and shows the great importance of archæological investigations, in the study of the physical changes that have taken place on the earth's surface.

Meteorological and Tidal Observations in India.—Within the last three years, the Indian governments have established a more systematic method of meteorological registration, under the superintendence of special reporters. A regular series of careful observations has been taken at the Surveyor-General's Office at Calcutta,

and others at the Madras Observatory, and at Bombay, for a long course of years; and an order has existed for many years enjoining the registration of the thermometer and rain-gauge at civil stations and hospitals. But since 1867 all work of this kind has been placed under special reporters, whose duty it is to inspect the various stations, reduce the observations, and submit annual reports on the climatology of their provinces. Mr. Blanford is the meteorological reporter to the Bengal Government; and he has worked very zealously to establish numerous efficient stations, and to utilise the observations that are thus accumulated. Dr. Murray Thompson and Dr. Neil occupy the same positions in the North-West Provinces and the Punjab; and the observations in Madras are superintended by Mr. Pogson, the astronomer. In future years, we may fairly anticipate valuable results from the systematic labours of the meteorological reporters, which will throw light on questions connected with the monsoons, and other special features of Indian meteorology. Tidal observations have, notwithstanding the urgent representations of Dr. Whewell, been hitherto much neglected in India. But Mr. Parkes, the consulting engineer of the Kurrachee Harbour Works, has recently investigated the phenomena of Indian tides with ability and success, and has published useful tide-tables, based on good series of observations, both for Kurrachee and Bombay. It is to be hoped that similar observations will be made at other points on the coast of India.

I cannot conclude this brief review of the work of surveyors and other scientific observers in India, without noticing the greatly increased facilities for obtaining maps and other official publications connected with geography, which have resulted from the establishment of a Geographical Department at the India Office, so ably directed, as it is, by our senior Secretary, Mr. Clements Markham, who has brought together all the knowledge above mentioned. Formerly the sheets of the atlas were the only official maps that were accessible to the general public. Now all maps published by the Surveyor-General at Calcutta are supplied at once by the agents appointed by the India Office; while a very complete catalogue prepared by Mr. Trelawney Saunders, the Assistant Geographer, enables the engineer to see at a glance the extent of the country of which the maps are already on sale, with their size and scales. Mr. Saunders has also prepared, by order of the Under Secretary of State for India, two small but elaborate maps of the mountains and river-basins of India. In these maps the Himalaya

mountains, especially, are distinctly delineated in a new form, the great chain of peaks being represented as a culminating outer range, separated by a series of elevated valleys from an inner range, which form the water-parting between the basins of the Ganges and Sanpu. The relation of the Himalaya to the Karakorum mountains, the Gang-dis-ri, and the lofty plateau of Tibet, is also defined; and the Kuenlun is represented as the northern escarpment of the Tibetan plateau descending to the depressed plains of Gobi. In general, the orography of this little-known region of highlands has been so distinctly defined by Mr. Saunders, as to invite further critical attention to the subject.

ASIA.—*Central Asia*.—I announced to you at the opening of the Session the irreparable loss which the Society had sustained in the death of that enterprising and accomplished explorer, Mr. Hayward, who it was once hoped would have solved the great problem of Central Asian Geography by traversing the Pamir Plateau from the frontier of India to the Russian possessions on the Jaxartes. A very full and interesting account of all the circumstances connected with the foul murder of this promising traveller was contained in a letter, which was written to myself by the agent, Mr. Frederick Drew, who was sent to investigate the matter on the spot, and which has since been read at one of our evening meetings and published in the 'Proceedings' of the Society; and I am now enabled to state that further intelligence has been received by the Government of India, from an independent source, which confirms the main points of Mr. Drew's Report, and shows that in the country itself, and among the hillsmen acquainted with the details of the actual outrage, no suspicion is entertained of the complicity of the Cashmere Maharaja or his officers. There are some grounds, however, for believing that the murderer, Mir Wulee, of Yassín, did act at the instigation—or at any rate with the full consent—of the powerful Chitrál Chief, Aman-el-Moolk, whose jealousy was aroused by the intrusion of a European traveller into the mountains; and if any measures, therefore, of retribution are ultimately decided on, it is probable that Chitrál will be held equally responsible with Yassín. In the meantime the Maharaja of Cashmere has undertaken to erect a monument to Mr. Hayward's memory in the Gilghit Valley, and a suitable inscription has been sent out from England to be engraved upon the tomb. A few books and papers were recovered from Mr. Hayward's effects, and are expected shortly to arrive in England;

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but it is not likely that they will contain any geographical information beyond that already presented to the Society, as Mr. Hayward had only proceeded two stages in advance of his former station at the head of the Yassin Valley when overtaken by the assassins whom Mir Wulee had sent upon his track. The present whereabouts of the murderer are not positively known, but it is believed that he has taken refuge with the famous Akhoond of Swát, at a short distance from our Peshawur frontier; and his identification, at any rate, is rendered easy by a limping gait, which is likely to be permanent, as he sustained a compound fracture of the leg from the kick of a horse during his recent wanderings, and the bone has never properly united.

But although our hopes of obtaining through Mr. Hayward's energy and skill a complete map of the hydrography of the Pamír lands have been thus disappointed, considerable progress has been made through other means in clearing up doubts regarding the physical features of that interesting region. One of Major Montgomerie's native explorers, who rejoices in the pseudonym of "the Mirza," and who has proved himself to be a worthy companion-traveller to the celebrated Pundits, has lately executed a very remarkable survey of the southern portion of the Pamír Plateau. Following in the footsteps of our early medallist, Lieutenant Wood, from the Afghan frontier to the junction of the two arms of the Upper Oxus at Kileh Penj—with some unimportant variations in the route along the river of Badakhshán—the Mirza succeeded, under the most trying circumstances, owing to the severity of the winter season, in tracing up the southern arm of the river to one of its sources in an alpine lake, named Pamír Kúl or Berket-i-Yassin; and having thence crossed the watershed into the river-system of Yarkand, he visited the little-known city of Tash-kurghán, and subsequently proceeded by an entirely new route to Yangi-Hissar and Kashgar. The Mirza cannot claim a complete priority of discovery in his delineation of the route from Kileh Penj to Tash-kurghán, for another native traveller, Mohammed Amín, had already followed the same track and published his itinerary in Mr. Davies's Report on the North-western boundary of India; and a similar route, indeed, had been supplied to Macartney when he attempted, sixty years ago, to map this region about the sources of the Oxus; but Major Montgomerie's *employé* has, at any rate, the credit of being the first explorer who has taken an astronomical observation at Tash-kurghán since the time of the Jesuits, or who has furnished

any trustworthy data of the geography of South-Eastern Pamir suited to the scientific requirements of the present day. The remarks, indeed, of Major Montgomerie on the line of watershed from Ladak to Kokan,—as well as on the physical features of those great mountain-chains which invariably exhibit their culminating peaks on transverse spurs in advance of the watershed, and on the correct determination of the longitudes of Kashgar and Yarkand, all of which are based upon materials supplied by the Mirza,—must be of the highest interest to Geographers, and merit the warmest acknowledgments of this Society. The Mirza's achievements are summarised by Major Montgomerie in the following pregnant sentences:—“This total route-survey extends to 2179 miles, about 350 miles of this ground being entirely new. The heights of 28 different points have been determined by boiling-point observations, and 48 observations for latitude have been taken at 14 of the principal stations on the route.”

In my last Anniversary Address I informed you that Mr. Douglas Forsyth, accompanied by that observant and accomplished traveller Mr. Shaw, had proceeded on a mission from the Viceroy of India to the Court of the Atalik Ghazi at Kashgar. This mission, owing to accidental circumstances, has not perhaps achieved the full geographical results that might have been expected from it, but neither has it been infructuous. Although, indeed, owing to the Atalik Ghazi's absence on a warlike expedition against the Tunganis on his eastern frontier, Mr. Forsyth was unable to proceed beyond the city of Yarkand, yet, in that limited field of operations, he obtained valuable results from the labours of his subordinates. In the first place, by detaching a confidential agent from Cashmere to rejoin him, by a circuitous route, in the plains of Turkistan, he succeeded in obtaining a report of the road across the mountains, by the Darkote Pass, where Mr. Hayward was murdered, and from that point, through Tash-kurghán to Yarkand; while, on his return journey, he further utilized the services of Mr. Shaw, as I shall presently explain, in the exploration of a considerable portion of unsurveyed ground between the Karakorum and Kuenlun. Mr. Shaw is stated in Mr. Forsyth's Report to have used his instruments carefully and continuously throughout the route, and his register of observations, which has recently reached us, has proved of the greatest value in setting at rest the long contested question of the longitude of Yarkand. Major Montgomerie, from a careful comparison of the Mirza's route with all previously existing

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materials, had been led to assign to the city in question a longitude of $77^{\circ} 30'$; and this would have been accepted by geographers as a certain position had not Mr. Forsyth stated, apparently on Mr. Shaw's authority, that the true longitude was 76° . This alarming discrepancy of a degree and a half of longitude, which threatened to throw the whole map of Turkistan out of gear, has been now removed, by the calculation of Mr. Shaw's lunar observations by a computer at Greenwich, a mean result of 77° being obtained for the position of the city of Yarkand.

The only extension of geographical discovery which has been announced to us, on the part of the Russians in Central Asia, since our last Anniversary Meeting, has resulted from Col. Abramoff's expedition of last summer to the sources of the Zarafshan. In this expedition, the Russian troops crossed, on four different occasions, the snowy mountains, a prolongation of the Thian shan, which intervene between the valleys of the Jaxartes and the river of Samarcand; and found the passes to be from 15,000 to 16,000 feet above the level of the sea. Colonel Abramoff also carefully examined the two parallel valleys of the Macha and Yagnān, which run down from the western face of Pamir, and supply the head-waters of the Zarafshan. He found the Macha River to issue from a glacier which entirely blocked up the defile, and was reported to be 35 miles in length—the head of the glacier extending indeed to the eastward of the longitude of Kokan; while the sources of the Yagnān (to which, however, he did not penetrate) were reported to reach almost to an equal distance.

From these discoveries, it follows that the sources of the Zarafshan will have to be transferred about 100 miles to the eastward of the Fān Lake, where, in the maps recently published, the river has been held to take its rise. Colonel Abramoff further ascended the pass to the south of the Fān Lake, and stood upon the watershed between the the Zarafshan and the Oxus, looking over the rugged country which is drained by the Hissar and Kafir-nihan streams flowing to the southward. On his return to Samarcand, operations in the Keshtub and Maghian valleys, which furnish tributaries running north to the Zarafshan, likewise enabled the Russian commander to gain a tolerable knowledge of these hitherto unvisited localities; and the exploration of the Samarcand district, together with the adjoining territory of Shahar-i-sabz, may thus be considered to be now pretty well accomplished.

I am informed by Sir Henry Rawlinson that the geography

of the upper valley of the Zarafshan, and particularly of the Fân Lake and the Macha defile, admits of ample illustration from the Memoirs of the Emperor Baber, who frequently traversed these regions during the troubles through which he struggled to power. Most of the names, indeed, which have been recently brought to light by the Russian surveys are to be found in Baber, though hitherto not recognisable, owing to the faulty readings of the Turki manuscripts. Sir Henry will give ample explanations on this subject in his 'Monograph on the Oxus,' which will be printed in the next volume of the Society's 'Journal.'

Finally, it will interest geographers to learn that the Topographical Department of the Russian Government have quite recently completed a new map of their province of Turkistan, which will naturally contain all the new data gathered by the expeditions I have mentioned. It is to include also Western Siberia, and I trust we may be furnished with a copy, by the courtesy of the Russian authorities, to whom we are indebted for similar donations on former occasions.

In continuation of the observations I have already made regarding the Expedition of Mr. Forsyth, it gives me the highest satisfaction to mention that I have very recently received a long and instructive letter from our distinguished associate Mr. R. B. Shaw, the companion of Mr. Forsyth, descriptive of his journey across the mountainous region southwards and eastwards of the Karakorum Pass, to explore which he was detached from the rest of the party on returning from Yarkand. The letter is accompanied by a sketch-map of the Upper Valley of the Shayok, showing the line of watershed of this part of Central Asia. Besides determining correctly, by astronomical observations, the position and altitude of many spots hitherto unvisited, Mr. Shaw has delighted me, as a geologist, above all, by stating that he has determined the dip and direction of all the strata in this hitherto unexplored region; and has even collected many fossil shells, which, when sent home, will enable us to affix a precise age to the different rocks he has examined. His description of the difficulties which he and his followers experienced in traversing the deep defiles which lead from the western limit of the Tibetan plateau, and the rugged country of snow-clad peaks, vertical precipices and chasms, which extends from that point to the westward, is, indeed, most striking; and I have no doubt that, when this communication and map are

printed, they will form one of the most interesting and important parts of the volumes of our Society. The western edge of the great plateau is here edged by a huge wall of limestone mountains, placed like the *revêtement* of some gigantic embankment; and to this, in the opinion of Mr. Shaw, is due the preservation of the level uplands from the excavating action of rain and snow. For the clouds which drift up the Shayok Valley towards this lofty limestone chain are arrested by that phalanx of mighty peaks, and expend all their powers on its gradual destruction. The difficulties experienced by Mr. Shaw, in endeavouring to descend towards the old Karakorum road, are a sufficient commentary on this view of the physical structure of the region; his party being baffled in their attempts to penetrate the narrow water-worn gorges, where the naked limbs of his coolies were lacerated by the broken ice of the torrents, over whose beds they were compelled to march. This portion of the journey has furnished a real addition to the geography of Central Asia, of which the interest is enhanced by the varied powers of observation of this accomplished traveller.

Manchuria.—I learn through our Associate, Mr. Delmar Morgan, that an Expedition last summer, through Manchuria, under the auspices of the Imperial Russian Geographical Society, has accomplished results considered highly satisfactory to the executive of that important Body. The Expedition was entrusted to the command of the Archimandrite Palladius, and started from Pekin on the 13th of April, 1870, traversing the whole of Manchuria from south to north, *viâ* Moukden, Kirin, Petuna, Tsitsihar, Mergen and Aigun; a remarkable journey of nearly a thousand miles through one of the least known parts of Asia. Steaming down the Amur, Palladius next ascended the Ussuri to Lake Khinka, and, crossing the portage, arrived at the Russian port of Vladivostok on the shores of the Pacific. Being an Archæologist and Ethnologist, as well as a Geographer, and well acquainted with the Chinese language, Palladius devoted much of his attention to the study of the native tribes of Manchuria, their language, and the architectural traces of ancient civilisation. He has opened up, therefore, a new line of investigation, relating to the original seats and migrations of the old tribes which have had so powerful an influence on Chinese development. Ethnologists, as well as Geographers, will do well to consult the detailed account of that Expedition, which will, doubtless, be published in the Bulletin of the Russian Geographical Society.

In the western part of Mongolia, also, I learn, through a letter of Baron Osten-Sacken to Mr. Bates, a remarkable journey has recently been performed by Dr. Radlof, who visited the town of Khobdo in that little-known region. The narrative of this journey is to form part of one of the volumes published by the Russian Geographical Society. Another journey in the same country is that of M. Pavlinof, who travelled over the previously unvisited route from Khobdo to Uliassutai, and passed from this latter town across the Tangnu Oola range towards Minussinsk, in Eastern Siberia. The result of this latter journey is the accurate measurement of altitudes in the Tangnu Oola Mountains, and the rectification of our maps regarding the hydrology of the Upper Irtish.

Burmah.—The Expedition conducted by Major Sladen, our Political Agent at the Court of Mandalay, overland towards the Chinese frontiers, although it has not yet produced those commercial results which were expected, added considerably to our geographical knowledge of that part of Asia. The Expedition, as is well known, was intended to ascertain the possibility of opening up a route for commerce between the well-peopled and wealthy south-western provinces of China and the British Port of Rangoon, thus saving the extremely circuitous route by sea and along the Yang-tze-Kiang. Major Sladen ascended the Irrawady to Bhamo, and then marched north-eastward towards Yunan, succeeding in reaching as far as the town of Momein in that province. Political, rather than physical obstacles, seem to lie in the way of a large traffic being established in this region, the whole of this part of Yunan being dominated by Mahomedan insurgents against the Chinese authority. The information gleaned by this important Expedition is, at present, limited to an official Report scarcely accessible to the public. It is desirable, therefore, that the able leader may be induced to communicate it in some more accessible form, either as a contribution to our Society or as an independent work. Dr. J. Anderson, the Naturalist attached to the Expedition, a memoir from whose pen on the Irrawady appears in the new volume of our 'Journal,' brought home valuable collections of Natural History, besides an extensive series of drawings and photographs of the little-known wild tribes, and the magnificent scenery, of the Upper Irrawady and the mountainous region beyond, and I believe I express the wishes of all men of science in this country in hoping that the Indian Government will grant some aid towards this publication.

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CHINA.—*The Upper Yang-tze Expedition of 1869.*—Since the opening of the Yang-tze Kiang to steam-navigation as far as Hankow in 1861, and the venturesome expedition of Captain Blakiston's party in the same year, the Upper Yang-tze has attracted much attention from explorers as well as merchants, &c. In 1869, Sir R. Alcock, her Majesty's Minister in China, despatched Mr. Consul Swinhoe to examine and report on the commercial capabilities of that part of the Great River, with a view to the impending revision of the Treaty of Tientsin. Mr. Swinhoe was wise enough to invite the Chamber of Commerce at Shanghai to send representatives to accompany him on his journey; and from the joint reports of the party we have obtained much valuable information, both as regards the geography and hydrography of the Upper Yang-tze and the nature of the products and trade of the region. One of the delegates of the Shanghai Chamber was Mr. A. Michie, one of our associates, and well known as the contributor to our Journal (vol. xxxiii.) of a memoir on his former journey from Tientsin to Moukden in Manchuria. These gentlemen fully confirmed the reports of previous explorers as to the great wealth and population of the province of Szechuen. Mr. Swinhoe's party did not go further than the chief commercial city, Chungking, and consequently did not reach the fertile plains of Szechuen. Yet even the rugged country through which they passed is described as being remarkably rich, the soil being particularly adapted to the growth of opium, tobacco, wood-oil, &c., besides furnishing a fair proportion of ordinary cereal crops.

The party ascended in one of her Majesty's gunboats, under the orders of Admiral Sir Henry Keppel, K.C.B., to the town of Ichang, 360 miles higher up the Great River than Hankow, thus practically demonstrating the navigability of the river to that point. At Ichang, however, commences the long series of rapids, which extend for 100 miles to the town of Kwei-foo, and even beyond that point continue to be met with at intervals. Navigation of these rapids by foreign-built steamers is considered impossible for the present, though the native boats carry on a regular traffic on the river by means of towing and an enormous expenditure of manual force.

The examination of these rapids and obstructions by our naval surveyors of this Expedition may, indeed, be considered one of the most important geographical results of the mission. According to Mr. L. S. Dawson, the senior surveyor, there appears to be no hope

of steam-navigation being carried on through what is called the "Gorges of Ichang," that is, the series of reaches between Ichang and Kwei-foo, where the bed of the Great Yang-tsze is contracted between lofty precipices of rocks, and the channel beneath encumbered with huge boulders. The depth of the water in the gorges was found to be generally more than twenty fathoms, but in one gorge forty-four fathoms were obtained. So violent and uncertain are the currents which sweep from side to side among the rocks, that it was found almost impossible to follow out the survey in a boat, with ten rowers. Commander Stokes, of the gun-boat *Opossum*, states that the rise of water in the summer in these narrow straits was from sixty to eighty feet; and believes that it is due to the melting of the snow on the mountains between China and Thibet. In the rapids the velocity of the current was from eight to ten knots an hour.

How to bring the large and wealthy province of Szechuen into closer commercial relationship with this country is the interesting problem which the delegates of the Shanghai Chamber of Commerce set themselves to solve. Swift, safe, and easy communication is the obvious desideratum; but the mountainous nature of the country seems to preclude the means which would solve the matter in any other country, viz., railways, at least until the introduction of that admirable conveyance has been assented to by the Chinese Government, and has been tried in some more accessible part of the country, where fewer difficulties would have to be encountered. In the meantime the delegates recommend the extension of steam navigation as far as it can be rendered practicable, viz., to Ichang, a measure which would, it is anticipated, result in a considerable increase in the sale of British manufactured goods in that part of China.

An enterprising Prussian, the Baron von Richthofen, after doing good service to geological science in the United States of America, has, during the last two years, been actively engaged in China in investigating its geology and mineral productions. In 1870, under the auspices of the merchants of Shanghai, the Baron made the journey from Canton to Peking overland, *viâ* Hankow; and, though the matured results of this important survey will not see the light until the explorer has returned to Europe, and had time to prepare his materials, yet the preliminary Reports he has already published, from time to time, warrant the conclusion that his information will be of the most valuable practical kind. For a perusal of these

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Reports, copies of which were forwarded to the Foreign Office, I am indebted to the courtesy of Lord Granville.

The various coal-fields in the province of Hoo-nan have been described by the Baron, and new light has been shed on the mineral wealth of that province generally. As Hoo-nan was known to be a large consumer of foreign goods, it was an object of interest to ascertain how far the principal river which drains the province through the Tungting Lake was navigable by steamers; this point Baron Richthofen settles unfavourably, with regard to the prospect of steam-navigation. Except in the brief and capricious season of floods, the Siang is only capable of floating boats of very light draught carrying a few tons of cargo. On the other hand, however, certain lines of traffic are shown to be well adapted for railways.

After traversing Hoo-peh, and describing minutely the resources of that province, and the capabilities of the River Ham, which falls into the Yang-tze at Hankow, the Baron explored Honan and Shansi; and in the latter province he met with the richest reward of his labours, "one of the most remarkable coal and iron regions in the world." The Baron estimates the coal-field of Shansi to be considerably greater than that of Pennsylvania, and to be capable of supplying the whole world, at the present rate of consumption, for thousands of years to come. As an illustration of the thickness and extent of these carboniferous beds, he says that were a railway ever to be constructed in that region it would be tunnelled for miles through the coal-beds. These vast resources are not utilised owing to the unskilfulness of the natives in mining, and chiefly to the absence of roads. There being no available water communication, and the bridle-roads being indescribably bad, the coal and iron of Shansi cannot be profitably transported for more than a few miles. The Baron predicts a wonderful improvement in the condition of the people, and the stability of the government, when railways are permitted to connect these great mineral regions with the coast.

Herr von Richthofen has, in one of his Reports, remarked on the deterioration of the climate in Central and Northern China, the present condition of agriculture comparing unfavourably with that of former times, as described in the historical records. This deterioration he attributes to the destruction of the forests for fuel—and this on the very area of some of the richest and most easily worked coal-fields in the world!

This distinguished geological surveyor had in contemplation a

still more important journey, namely, to Szechuen, Yunnan, and thence eastwards to Canton, at the point of starting, the atrocious massacre of foreigners against tsin occurred, which revealing a powerful conspiracy against foreigners, the Baron wisely declined to trust himself in the interior so long as the people were exposed to such bad influences. It is to be remarked, however, that the Baron speaks in the highest terms of the friendly disposition of the Chinese people when left to themselves.

Whilst the geography and topography of China, as well as its present commercial condition, archaeology, and so forth, are continually receiving new light by the researches of many of our talented countrymen and other Europeans in China, whose contributions are published in the 'Journal of the North China Branch of the Asiatic Society,' papers of value are occasionally communicated to our Society and attract much attention. Such, last Session, was the Memoir by Mr. Ney Elias on the 'New Course of the Yellow River,' which gave us for the first time accurate information regarding that remarkable phenomenon, the diversion, by spontaneous movement, of the waters of the great Hoang-Ho, or Yellow River of China, which occurred in 1851, but was not completed until 1853. The investigation of this subject was undertaken by Mr. Elias, one of our younger associates, through a pure love of geographical exploration, during the summer holidays taken from active commercial pursuits at Shanghai, and the manner in which he carried out his examination did him the highest credit. He traced the new course of the river down to its new embouchure in the Gulf of Pechili, and visited the spot where the river had broken away from its old bed by the rupture of its northern banks, fixing positions by astronomical observations, and making a survey of his route, which enabled him to complete an exceedingly good map of the country he traversed. As Mr. Elias's Memoir and map are published in the recent volume of our 'Journal,' and are consequently in the hands of Fellows, I need not further dilate upon the subject here. Another memoir, in the same volume of the 'Journal,' entitled 'A Journey through Shantung,' by Mr. John Markham, our Consul at Chefoo, gives us a mass of exceedingly curious and novel information regarding this picturesque and wealthy province of China, and especially regarding the city of the great Chinese sage Confucius, which place was visited and

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studied under unusually favourable circumstances by Mr. Markham. A third paper, published in our 'Proceedings,'* by Mr. Alexander Wylie, gives an account of a journey made by the author over a part of the interior of China, of which exceedingly little was known, namely, from Ching-tu in Szechuen, overland, and by tributaries of the Yang-tsze, to Hankow.

AUSTRALIA.—In my last Address I had occasion to notice the expedition of Mr. Forrest into the interior of Western Australia, in search of the reported remains of Dr. Leichhardt's party. Since then, this very able Australian explorer has been wisely engaged by the Governor of the Colony of Western Australia, Governor Weld, on a new expedition, having a more direct practical bearing on local interests than the former one. This was to discover a route by land, suitable for general use, between Swan River and Adelaide. The route would be along the same tract of coast-country, round the great Australian Bight, which was the scene of the great efforts and sufferings of Governor Eyre in 1840-1. Governor Weld's expedition, which has attracted considerable attention in our Australian colonies, I rejoice to add, has been successful, and a narrative of it, illustrated by a sketch-map, will appear in the next volume of the Society's 'Journal.'

Mr. Forrest's party left Perth, Swan River, on the 6th of April, 1870; reached Fowler's Bay, in the settled districts of South Australia, on the 27th of July, and Adelaide on the 28th of August. The line of march was generally near the coast; but at intervals short trips were made inland, for a few miles, to ascertain the nature of the country. By an excellent arrangement, a schooner with provisions and stores was sent along the coast, touching at three distant points, and carrying that succour to the Expedition which was so indispensable in the arid, desolate region over which it travelled. The country, to long. $124^{\circ} 25' \text{ E.}$, was found destitute of permanent water. A little further east, an effort was made to push for the water mentioned by Eyre, in long. $126^{\circ} 24'$, and lat. $32^{\circ} 14' 50''$; and, after eight days of toilsome march, it was re-discovered. Some part of this district was found to be a fine, grassy, level country, about 300 feet above the sea-level, and moderately wooded; further towards the interior, as far as the eye could reach, the land was equally level, but less wooded. Further east, a fine grazing-country was traversed, superior to the settled

* Vol. xiv., p. 168.

portions of Western Australia. The great distance of more than 400 miles, a limestone table-land constitutes the whole of the coast-country. In short, the general impression derived from the Report of this able pioneer is, that nothing but the absence of permanent water, arising chiefly from the level nature of the land and its altitude above the sea (generally 300 feet), prevents the whole of this extensive coast-region from being a promising country for pastoral settlement.

In other parts of Australia the opening up of the vast unknown interior has been gradually progressing since the remarkable journeys of Macdonall Stuart and Burke and Wills (with those of the parties sent in search of the latter), rather by the continued advance of sheep-farmers, in search of new pastures, than by geographical expeditions. The accounts of these enterprising squatters are seldom brought before our Society; but, lately, we were favoured by Mr. T. Elder with a copy of a letter from one of his *employés* in South Australia, which contained an interesting account of discoveries made to the north of Lake Eyre by Mr. John Ross, who had penetrated, in search of pastoral country, as far as $24^{\circ} 30'$ on the meridian of 137° , and found a well-watered region, with the streams flowing southward into Lake Eyre. The account given by this explorer seems to indicate a fertile region in the very centre of the Australian continent. "The country," according to Mr. Ross, "is one continued scene of mountain, hill, and plain, with permanent watercourses in all directions and of various magnitude." What is still more remarkable is the statement that, by river and lake, there are 300 miles of water in this central region available for steam-navigation. This fine country, it will be found on reference to a map, is situated midway between Macdonall Stuart's track across the continent, and Captain Sturt's "Stony Desert," where the Expedition under the command of this courageous explorer suffered so fearfully from the heat and dryness in 1845. It lies also some distance to the north of Warburton's track in 1866, and seems a northerly continuation of the tract of well-watered and, to some extent, swampy, country traversed by this last-mentioned traveller. If the favourable account given by Mr. Ross be confirmed by subsequent exploration, and the promising appearance described by him be not the effect of an unusually propitious season, the ideas generally entertained of the barrenness of the Australian interior will have to be greatly modified, and the colonists are to

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be congratulated on the promising future they have before them. At any rate, these and other accounts go far to confirm the opinion of those, who believe that the fertile and barren districts of Australia lie in meridional bands, or in long belts from north to south. To geographers it is peculiarly gratifying to learn, that the progress of settlement and civilisation follows in Australia the lines of route of the great geographical expeditions. It is thus that the telegraph, now in course of construction from Adelaide to the northern shore of the continent, will be laid along the line of march of our medallist Macdonall Stuart.

The Trans-Australian Telegraph, just alluded to, has, indeed, followed rapidly in the wake of geographical discovery. It will have a very important bearing on many topics which have interested the Royal Geographical Society in former years, and is remarkable as demonstrating how quickly Macdonall Stuart's arduous and apparently unprofitable journeys have been made the basis of commercial advancement.

In my Address for 1865,* I gave a rapid summary of the progress of discoveries in this vast country. Commencing with the small area around Sydney—all that was known to the world in 1830—they have extended over two-thirds of its area; now, for the most part, occupied, in a wonderfully rapid way, by enterprising settlers. So rapid has been the progress, that we are apt to forget that it was only in 1862 that the continent was first crossed from south to north by our brave medallist Macdonall Stuart. On July 25th, in that year, he reached the sea south of Melville Island. For his previous and tentative journeys the Royal Geographical Society awarded him a gold watch in 1858, and its Patron's Medal in 1860. In presenting the medal to the Duke of Newcastle on his behalf, I remarked that this journey would not only cause the occupation of the intermediate country,† but would soon lead to the formation of regular settlements on the north coast of the continent:‡ a prediction fully verified in the establishment of the colony at Port Darwin, and the rapid progress of settlement from the southward. And, further, referring to the prospect of future telegraphic communication, I expressed a hope that the first message should be coupled with the name of our late medallist

* 'Journal,' vol. 35, pp. cxxxiv.-cxliv.

† Ibid., vol. 31, 1861, pp. cviii.-cix.

‡ I have repeatedly advocated the establishment of a Northern Colony. See Addresses, 1859, pp. cxxx.-i.; 1861, p. cviii.; 1862, p. clv.; 1863, pp. clxii.-clxx.; 1865, p. cxlvii.

"Maodonall Stuart." It would have been a bold prophecy that should have predicted so early an extension of this very line of communication. Considering the rival interests between Queensland and the eastern colonies, it is remarkable, that this most western route across the continent should be the basis of the first telegraphic enterprise to connect Australia and New Zealand with the rest of the world.

The legislative sanction of the South Australian Government to the telegraph scheme of Mr. Charles Todd was given in September, 1870, and the surveying parties immediately commenced their operations. The line passes in a northerly direction from Port Augusta, at the head of Spencer Gulf; then along the routes of Stuart, passing Mount Margaret, his final starting-point. At the end of February last, the line was completed and in operation beyond this, and by this time has probably reached the tropic. At the northern end it proceeds to the south-east on leaving Port Darwin, threading a most fertile country, equal, for pasturage and settlement, to the best parts of South Australia, and striking Stuart's track in about lat. $13^{\circ} 14'$ s., within 50 or 60 miles of the north coast. Any doubts regarding the accuracy of Stuart's narrative have been entirely dispelled by the telegraphic parties, who found his camp-trees marked with his initials, and also the recent tracks of a horse, which must have strayed from him, as he relates, seven and a half years previously. Throughout the survey, both in the north and the south, our traveller's reports of the country are entirely confirmed.

The length of this line of telegraph will be about 1800 miles. It is much aided by the circumstance that the River Roper, passed by Stuart, has been found navigable for a considerable distance from the Indian Ocean, affording a ready means of transport for the *matériel*. By means of this telegraph, the northern colony at Port Darwin will be placed in immediate connexion with Java, Singapore, and India, on the one hand, and with the rest of Australia on the other: from both of which directions its prosperity must come. In the interior of the continent, destitute of navigable rivers, and with wide areas suffering periodically from drought, the line will afford a perfect safeguard to settlers or travellers who may be within its range; as, should any adverse circumstances arise, they can at once make their wants known where aid can be obtained. This completion of the telegraphic system from one extremity of the globe to the other will finally solve another problem important

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to us, namely, the exact and final determination of geographical positions. I may remind you that this was one of the original objects of the Society, the attainment of which at that period could only be arrived at by long and laborious astronomical and trigonometrical operations, with results known to be open to considerable doubt.

Thus, in our early days, our medal was awarded, in 1836, to Captain Robert FitzRoy, for his surveys, one portion of which was the first complete chain of meridional distances carried around the globe. Yet, with the most refined precautions, the entire series was 33' of time, or above 8' of arc, in excess; a portion of which was made at Rio Janeiro at the commencement of the chain. Again, in 1840, Lieut. Raper, R.N., received our Founder's Medal, chiefly for his elaborate discussion of the longitudes of the principal maritime places of the world, which showed how large were the discrepancies, and how much doubt was cast on the best-ascertained meridians. The electric telegraph determines instantly and with perfect accuracy, which is unattainable by ordinary geodetical operations, the differences of longitude between the observing-stations,—a process which has been carried out for all the chief parts of Europe and America. A notable example of this was given in the electrical determination of the difference of longitude between Greenwich and Paris, believed to be the most accurately known of all. After nearly a century of continuous and indefatigable measurements, it was believed to be somewhere between $2^{\circ} 20' 15''$ and $2^{\circ} 20' 24''$ of arc; but in 1854 M. Le Verrier determined, from a mean of nearly 2000 electric signals, any single one of which was more accurate than all the previous measurements, that the true difference is $2^{\circ} 20' 9.45''$ of arc, or more than a second of time (a large quantity in astronomy) less than previous results.

New Zealand.—Dr. Haast, the very able geological surveyor of Canterbury Province, New Zealand, has sent us a valuable contribution on the physical geography and topography of the New Zealand Alps, in continuation of his important memoirs published in volumes xxxiv. and xxxvii. of our 'Journal.' The recent paper, which he modestly puts forth as Notes to accompany his Topographical Map, which itself is a magnificent addition to New Zealand geography, contains some observations of striking interest on the changes which have preceded the present physical condition of this central part of the Southern Island. It is by such observations that the science of geology is brought into close connexion

with that of geography, and the conclusions are of equal value to the students of both these great branches of human knowledge.

Dr. Haast compares the snow-clad mountains of the Canterbury Province, which, as you are aware, lie parallel and near to the western coast of the island, to the Alps of Europe; and shows the similarity between the two in their glaciers, and especially in the action of the warm winds, which, blowing from hotter regions, cause a rapid melting of the snow on the side of the mountains facing the direction of the wind. In fact, all the principal meteorological phenomena encountered in the European Alps occur also in New Zealand, the "nor-wester" of the latter country being the representative of the "föhn" of Switzerland. The nor-wester having blown over a wide extent of ocean, and become charged with moisture, is the chief source of the copious precipitation which, in the form of snow, caps the New Zealand peaks, and forms those large fields of névé which supply the great glaciers of the country. The glaciers and snow-fields are stated by Dr. Haast to exceed in dimensions those of Switzerland; and he adduces further proof of the curious fact, which had already excited much interest among physical geographers, that glaciers descend much lower on the western than on the eastern slopes of the mountains, and on the West Coast are in close contiguity to a luxuriant forest vegetation, consisting of pines, arborescent ferns, and flowering shrubs; such, for example, are the Francis Joseph and Prince Alfred glaciers. On the eastern side, although of larger dimensions, they descend in the Canterbury Province no lower than 2500 feet above the sea-level. The cause of the difference is owing partly to the smaller amount of moisture on the eastern, or leeward side, and partly to the less abrupt slope. Large as the New Zealand glaciers and snow-fields are at present, they were formerly, in post-pliocene times, much more extensive: proofs of this are seen in all directions, in vast moraines heaped around the lakes lying at the foot of the mountains, and in marks of glacier action at levels far below their present limit. Dr. Haast believes that the elevated plateau districts, which support the névé fields, were at that time much more extensive, and that glaciers, reaching the sea, gave off from their extremities detached portions, which floated away to the North as icebergs, as they do in Greenland at the present day.

With regard to other parts of these important islands, I may mention that a lively picture of the volcanic districts of the Northern

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Island of New Zealand was given in Lieut. Meade's journals, published last year; and that a valuable Paper on the Province of Southland, by Mr. Marten, has recently appeared in Mr. S. W. Silver's 'Circular and Colonial News.' This Paper is one of the results of a printed series of suggestions and queries regarding physical geography and statistics which Mr. Silver issues to his numerous correspondents in all parts of the world where commercial relations have been established.

New Guinea.—The proximity of our new settlement at Cape York, and the number of vessels engaged in the pearl and Bêche de Mer fisheries in Torres Straits, have led to more frequent communication with the natives of that great and still almost unknown land, New Guinea. In my last Address, I had occasion to notice a visit made by Captain Delargy to a village on the southern coast of the island, concerning which the most remarkable circumstance was the friendly welcome accorded to the strangers by the distrustful and warlike natives. Since then we learn from an official report of Lieutenant Chester, the Government Resident at Somerset, Cape York, that he himself visited a native settlement on the south coast, in company with Captain Banner. It appears that a display of armed force and great precaution are necessary in these undertakings; and the native interpreter brought from Warrior Island, in the Straits, was careful to recommend to Lieutenant Chester to say to the Papuan chief of the village that, although desirous of being on friendly terms with him, he was prepared to fight if the natives preferred it. No progress, in fact, has been made towards winning over these formidable people to peaceful commercial relations with the traders of the Australian seas; and not a little of the difficulty, according to Lieutenant Chester, arises from the criminal plundering of the native plantations by boats' crews landing on the coast. Unprovoked aggression on the part of the Papuans, he believes, is not likely to occur, as their well-constructed villages and large well-fenced plantations are too valuable to be lightly risked. An interesting item of ethnological information contained in his narrative, is the existence of wild tribes of aborigines in the interior, with whom the agricultural coast villagers are in frequent hostility.

SOUTH AMERICA.—In the continent of South America the work of exploration and survey is making steady, if somewhat slow, progress. Several of the independent Governments are now, or have lately

been, engaged in the systematic survey of their vast and thinly-populated territories, publishing the results in maps of greater or less completeness. Thus, the Republic of New Granada, now called the United States of Columbia, lately brought out an Atlas founded on the incomplete surveys of Codazzi; and the prosperous State of Chili, as I had occasion to record in my last Address, is following the example, by issuing well-prepared maps of its central provinces. In the great Empire of Brazil no accurate official survey has yet been instituted of any large portion of the country, but partial surveys, particularly of the Southern Provinces, the River St. Francisco, and large portions of the Amazons have been executed; and we have lately learned that an Imperial Commission has been appointed for the preparation of a general map of Brazil, in which the material furnished by all these local surveys will be for the first time made available to geographers and the public in cartographical form. The Commissioners have been in correspondence with our Council, through our Medallist Mr. Chandless, with a view to the amicable interchange of geographical information.

The Government of Peru has continued the laudable work of exploration of the little-known interior of their country, to which I alluded in the Anniversary Address of 1869. For my information regarding the progress since made, I am indebted to our able corresponding member at Lima, Don M. Felipe Paz Soldan. According to his Report to our Council, the general survey of the more important rivers of the trans-Andine territories of Peru has continued without interruption; the Government of Peru attaching much importance to this work, as being indispensable to the peopling of these fertile regions, and the opening-up of communications with Europe by way of the Amazons and the Atlantic. River steamers have been built and costly establishments maintained, directed by European and North American engineers and surveyors, in pursuance of this great object. The exploration of the Rio Utcubamba and others has been entrusted to Mr. Arthur Wetherman, who has made an accurate survey, fixing numerous points by astronomical observation. The Pachitea River has also been more carefully examined, and found to be easily navigable,—a result of much importance, as it confirms the hopes that a great commercial route will be soon established, leading from the peopled districts of Peru to Europe by means of the Amazons (with which the Pachitea communicates) and the Atlantic Ocean. A little further south, the survey of the large rivers flowing towards the Amazons from

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the neighbourhood of Cerro de Pasco and its silver-mines has been undertaken. Three rivers—the Paucartambo, the Occobamba, and the Chanchamayo—here unite to form the Perene, a stream 350 feet broad and 3 fathoms deep. The interesting problem still remains to be solved, whether the Perene is navigable to its junction with the Tambo and the Ucayali; in which case a river-navigation of enormous length, by steamers, will be possible from the Atlantic to within a moderate railway-ride of Lima.

An important contribution to our knowledge of the river-systems of South America is the result of the Surveys of the Rapids of the Madeira River, by Messrs. Joseph and Francis Keller, engineers in the service of the Brazilian Government. The object of these surveys was to ascertain what engineering works will be necessary, in order to overcome the obstacles which these Rapids offer to rapid communication, between the Atlantic and the interior provinces of Brazil: a question in which the Republic of Bolivia is also greatly interested, for the River Madeira appears to offer to the rich interior provinces of that country by far the readiest means of communication with Europe. According to the survey of the Messrs. Keller, there are no fewer than 18 cataracts and rapids, in succession, on the Madeira, obstructing navigation between the Mamore and the River Amazon, having a total fall of water of 228½ feet in an extent of nearly 230 miles. A railway has been proposed as the best means of avoiding these great obstacles.

From British Guiana we have had, during the past year, the details of the discovery of a waterfall, of great height and remarkable beauty, called the Great Kaieteur. This fall is situated on the River Potaro, a tributary of the Essequibo, on the left bank. It was first discovered by Mr. Charles B. Brown, of the Geological Survey of the Colony, in April, 1870, and described by him as formed by the River Potaro precipitating itself over the edge of the sandstone table-land of the interior, into the lower country of the Essequibo Valley. The total height was found to be 822 feet, and the width of water, at the edge of the fall, 123 yards. So interesting a discovery excited much attention on becoming known at Demerara, and Governor Scott commissioned Mr. Brown to make a second visit in June to make a more complete survey; the official Report resulting thereupon giving us most satisfactory details as regards the falls, as well as the geological and botanical features of the district. Thanks to the Geological Survey of this important tropical Colony, we are now tolerably well acquainted with its lithological structure and

mineral productions, and it is to be hoped the result will be published in a form accessible to the public. In the discussion which followed the reading of Mr. Brown's Report at our evening meeting, Mr. J. G. Sawkins, the Director of the Survey, alluding to the flat-topped mountains and table-lands which form so peculiar a feature in the scenery in the interior of British Guiana, gave a vivid description of Mount Roraima, first visited by Schomburgk, the most remarkable of these elevations. It is a huge mass of light-red sandstone rock, 18 miles in length, with perpendicular sides and perfectly level summit, rising 7500 feet above the level of the sea. The flanks, forming bare, vertical walls 1500 feet high, are insurmountable; but the summit is known to be the source of several streams, which leap from the edge of the plateau in magnificent cascades, and flow in different ways to feed the Essequibo, the Orinoco, and the Amazons.

At the southern extremity of the continent a remarkable journey was performed in 1869-70, by Lieutenant G. C. Musters, throughout the whole length and breadth of Patagonia, a country hitherto deemed one of the most inhospitable in the world, and inaccessible to travellers on account of the hostility of the savage tribes who wander over its desolate plains. The account of his journey, given by Mr. Musters at our evening meeting of the 13th December last, excited the liveliest interest. Scarcely anything was previously known of the interior of this country, as will be seen on reference to the excellent summary of Spanish and other expeditions, given by our secretary, Mr. Markham, on the same evening.* In fact, little more than short excursions inland from the coast had been made, throughout the vast extent of land between the Straits of Magellan and the Rio Negro. Mr. Musters traversed the whole of this unexplored region, first crossing from Punta Arenas, in the Straits, to Port Santa Cruz, then in company with a tribe of Patagonsians, whose goodwill he had succeeded in gaining, skirting the eastern flanks of the Andes for 700 miles to the Rio Negro, and finally recrossing to Patagones, near the mouth of this river. Mr. Musters's paper, which will be published entire in our 'Journal,' gives us much new information concerning the rivers, lakes, soil, and climate of the country, and especially of the peculiar character and habits of the aborigines. His journey may, indeed, claim to be ranked among the most adventurous and successful of those

* 'Proceedings,' vol. xv. p. 49.

which have recently been undertaken by our enterprising fellow-countrymen.

Arctic Exploration.—Of the numerous Expeditions which have been sent by Sweden, Germany, and the United States of America to explore the North Polar Regions, since the days when England took the lead in that field of hardy enterprise, the voyage of Count von Zeil and Herr von Heuglin last summer, in East Spitzbergen, has probably offered most novelty to geographers. This undertaking was carried out in the months of July, August, and September, and its object was to penetrate to the eastern channels and islands of the Spitzbergen group, which had not been visited by the previous Swedish expeditions under Nordenskiöld, Von Otter, and others, and, in fact, had hitherto remained little better than a blank on our maps. That blank, thanks to the enterprise of these gentlemen, is now filled up, and the information imparted, owing to the well-known scientific qualifications of Herr von Heuglin, is exact and comprehensive. The small vessel in which the party sailed proceeded, first towards Edge Island or Stans Foreland, and, on finding the ice not yet cleared from the south-west coast, struck westward and then northward, navigating the whole length of Stor Fjord as far as Helis Sound. Landings were effected at many places on the east coast of the main island of Spitzbergen, as well as on the two large islands to the eastward; excursions were made in the interior, and astronomical observations and bearings taken to fix positions, besides large collections obtained in illustration of the natural history of the group. At length, in the middle of August, they succeeded in passing by boat through Freeman, or Thymer Strait, to the eastern side of Stans Foreland, and from Mount Middendorf, a hill on the shore of the strait 1500 feet high, were gratified at beholding in the far distance to the east a large tract of land, with a range of lofty serrated peaks extending north and south for nearly 60 miles. Whether this land is the enigmatical Gillis-land, of which we have so often heard, appears not fully decided, but unquestionably these enterprising German voyagers have brought us for the first time definite information regarding this unvisited region. In returning, they skirted the western coast of Stans Foreland and visited Deicrow Sound, at its south-west extremity, early in September, before turning their faces homeward.

According to Von Heuglin the passability of these seas and channels entirely depends on the direction of the various branches

of the Gulf-stream and of the Polar current. The latter divides, in the high north, into two branches, one of which flows down the eastern side of Greenland, and the other down the eastern side of Spitzbergen; the Gulf-stream presses north-eastward, washing, therefore, the south-westerly sides of the Spitzbergen Archipelago. These currents have a decisive influence on the climate of the coasts; where the Gulf-stream flows the ice becomes more quickly broken up, and a milder temperature is communicated to the air; but the Polar current, scarcely higher than freezing point, even in the height of summer, keeps the ice in its neighbourhood from separating until the beginning of September, when a little is broken up and drifted south. It is, therefore, only in the latter part of the summer that the North Polar Sea is at all accessible.

This Expedition appears already to have stimulated other German efforts to follow up the same promising line of Arctic investigation; for I learn by a recent German publication that a small Norwegian vessel is to be equipped this summer, and a reconnaissance survey of the sea between Spitzbergen and Gillis-land to be made by Lieutenants Payer and Weyprecht, at the cost of the Austrian Government. The Swedes on their side are proposing to establish a permanent astronomical, magnetic, and meteorological station at Spitzbergen, with a view of preparing the way for renewed Arctic exploration; Professor Nordenskiöld, who already enjoys a high reputation as an Arctic explorer, having the intention next year of making a vigorous attempt to reach the North Pole, making the proposed Spitzbergen establishment his base of operations.

Regarding the German North Polar Expedition of 1869-70, under Captain Koldewey, in the *Germania* and *Hansa*, our Society has had the advantage of hearing an excellent account of this adventurous voyage and its results from the pen of Sir Leopold McClintock, who is so well qualified by his great Arctic experience to do justice to such a subject. Naturally basing his narrative on German accounts of the Expedition, especially that given in Petermann's 'Mittheilungen,' Sir Leopold limited his own remarks to well-deserved praise of the ability with which the details of the enterprise were carried out, and especially the endurance of the heroic crew of the *Hansa*, who, having to take refuge on an ice-floe in the open sea, on the destruction of their vessel in a fearful storm, were drifted southward several hundred miles, to within reach of a Danish settlement near the southern extremity of Greenland. As far as geographica discovery is

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concerned the Expedition did not accomplish much, but the staff of scientific men belonging to it succeeded in amassing a large amount of material in all branches of science, which we are assured will prove, when published, of great value. The *Germania* wintered near the southern end of Pendulum Island, near the locality of Sir Edward Sabine's magnetic observatory, when he visited the locality with Captain Clavering in 1823. From this point sledging expeditions in the spring of 1870 were undertaken, which reached as far as 77° north latitude. In returning down the coast a fiord, penetrating far into the interior of East Greenland, was discovered and partly explored. It is situated between Capes Franklin and Humboldt, and was found to be surrounded by a highly picturesque mountainous country, with sheltered and verdant pastures near the water, inhabited by herds of musk-oxen and reindeer. Some of the peaks in the neighbourhood were found to reach the height of upwards of 7000 feet. These inlets of deep navigable water, possessing a mild climate and abounding in animals, but unpeopled by Esquimaux tribes, seem to be most promising avenues to the exploration of the interior of Greenland, and it is to be hoped that some of our young English geographers, desirous of earning fame as discoverers—of whom I am proud to say we still number a few amongst us—will devote their energies and means in following up the opening thus indicated. From our Government, I deeply regret to add, no aid is to be expected.

I ought to mention, in connexion with this important voyage of Koldewey, which is designated the "Second German North Polar Expedition," that a Society was founded, last autumn, in Bremen, called the German North Polar Society, having for its object the promotion and management of all German efforts in the direction of Arctic enterprise. This Society has already held fourteen meetings, and publishes its proceedings. An important part of its present labours is the publication of the results of the voyage of the *Germania* and *Hansa*, of which the first volume is said to be ready for the press.

Before I quit the subject of Arctic enterprise I must not omit to mention that our relatives and rivals on the opposite side of the Atlantic have furnished the means to equip the well-known Arctic traveller, Mr. Hall, for another journey, during the present summer to the Polar regions, from the American side. Dr. Bessels, a German savant, who has acquired Arctic experience in a former voyage to Spitzbergen, is engaged as zoologist to this expedition,

and Dr. D. Walker, one of our associates, formerly surgeon to McClintock's exploring party, as I learn from a letter he has written to the Council of our Society, has also been engaged to accompany it. Having been furnished with a set of instruments on a former occasion for observations in Arctic America, our Associate has obtained permission to employ them in the American Expedition, and, I trust, we may receive from his pen, at a future day, some account of the exploration on which he is now engaged.

Whilst on the topic of Arctic discoveries, I am happy to be able to announce that our distinguished Associate, Captain Allen Young, intends to explore, as far as possible, and at his own cost, the interior of the fiords of East Greenland, and to devote future years in making geographical discoveries in his own yacht.

Again, I have just learnt from Mr. William Bradford, of New York, that in a vessel of 400 tons, manned by a crew of Nova Scotians, he has taken photographic sketches of all the principal features on the west coast of Greenland, up to latitude 76°.

In this survey he was accompanied by our Medallist, Dr. Hayes, and he speaks in high commendation of the bravery and ability displayed by the young British colonist who commanded his vessel.

AFRICA.—Concerning Africa, which usually offers so much geographical interest and novelty, I have this year but little to report, as regards discoveries by English travellers. The great Expedition of Sir Samuel Baker was, by the last accounts, slowly working its way, by the Giraffe arm of the White Nile, towards Gondokoro and the Albert Nyanza, and had, therefore, not yet entered upon the field where so much yet remains to be accomplished in the way of new exploration. In the south, we have received an account of the explorations of Mr. Thomas Baines, in the region between the Limpopo and the middle course of the Zambesi; in which direction this persevering traveller has been employed in examining the locality of the gold-fields and negotiating the privilege of working them with the Matabele chiefs. Mr. Baines' narrative (compiled from his itineraries by Dr. Mann) will appear in our 'Journal,' and his map will be seen to offer, for the first time, an accurate delineation of the watershed which limits, in that region, the Limpopo and Zambesi basins.

Dr. Livingstone.—The recent advices from Dr. Kirk, which were kindly communicated to me by Earl Granville, must have been

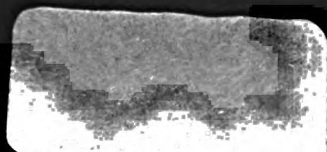
truly gratifying to all my Associates to whom I communicated them, as well as to the public at large. I have now a confident belief that the illustrious traveller was safe and well a few months ago.

Knowing that he was about to be fully supplied with provisions and medicine when he reached Ujiji from the west, we may anticipate that he might return to his native country in the course of this year.

But I now repeat the expression of the opinion which I published in my Address at the opening of the present Session, that if he had not, in his explorations, satisfied himself that the waters which he had followed from the south flowed into the Nile basin by the great lake Albert Nyanza, he would renew his arduous endeavours to solve the great problem of the true watershed of Southern Africa. The indomitable spirit of Livingstone would, in this case, prompt him to struggle until that great point was settled.

Even, however, as matters now stand, the last intelligence was a very cordial to myself, who have so long and so persistently looked to the eventual success of my absent friend.

Schweinfurth's Journey.—Whilst waiting for the account of the discoveries which Dr. Livingstone cannot fail to have made in the region west of Lake Tanganyika, geographers have been gratified to read, in Petermann's 'Geographische Mittheilungen,' the narrative of the explorations of the indefatigable German botanist Dr. Schweinfurth, in the region west of the White Nile and far to the north of the scene of Livingstone's explorations. As you are all aware, the accounts we had previously received of this portion of the African interior were limited to the narratives of Petherick's two journeys of 1858 and 1862, and to the accounts of the Expedition of the late Miss Tinné from the mouth of the Ghazal River to beyond the Djour. Since those remarkable journeys, we had heard only in a vague way of discoveries by the agents of the Messrs. Poncet, ivory-traders in those districts; and also of the journey, far to the south, of Signor Piaggia, who, having been received in a friendly manner by the chiefs of the Niam-Niam tribes, was able to travel further to the south-west than any of his predecessors, and brought back a report of the existence of another great lake in that direction. The accounts of these last-named travellers, however, did not admit of being delineated with any approach to accuracy on our maps; whilst from Dr. Schweinfurth,



who is still engaged following up his investigations, we have a large body of accurate information, founded, in the absence of astronomical observations—for which he had not the necessary instruments—on a carefully-made route-survey. He has succeeded in reaching a point about 50 miles beyond Piaggia's furthest, and 210 miles to the west of the White Nile, nearly on the same parallel as the northern end of Albert Nyanza ; but he does not confirm the Italian traveller's rumour of a great lake so far to the west. His most important discovery appears to be that of a river, the Uelle, flowing westward, probably into Lake Chad, proving that he had crossed the watershed of the White Nile on the western side of its basin.

CONNEXION OF GEOGRAPHICAL WITH GEOLOGICAL SCIENCE.

In the Anniversary Addresses delivered by me to the Society during the last three years, I have dwelt upon the connexion between geography and geology, more particularly in the direction of Physical Geography. From the evidence furnished to us by the rocks around us, whether of a physical or a palæontological kind, we are able to re-construct, in part at least, former conditions of the earth's surface, and to learn how the present outlines of land and sea, and the present distribution of plants and animals, are not original, but only the latest phases of a long-preceding succession. Geology thus becomes to us what I termed "the oldest comparative geography."

It is unnecessary for me to point out that just as in descriptive, and still more in physical geography, it is of primary importance to have regard, not merely to the external contour and climate of a country, but to the grouping of its plants and animals, so in geological research it is absolutely necessary to make constant appeals to the evidence furnished by the remains of the flora and fauna of ancient periods. Hence, though at first sight there might seem to be no very close or necessary connexion between geology, or, at least, that aspect of geology which I have called the oldest comparative geography, and the more purely biological sciences, there is in reality an intimate relation of the one to the other. And thus, in these my final and parting words to the Geographical Society, while I again bring under your notice the claims which the progress of Geology makes upon you, I wish to refer to this

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relationship, not alone for its own interest and importance, but because it gives me an opportunity of expressing a growing conviction of my later years that, alike in geographical and in geological research, we run some risk of being overshadowed and even elbowed out of an essential portion of our proper course as geologists by the paramount demands of some eminent biologists. No one who knows what my connexion with geological study has been will allow himself to suppose that in what I now say I would in any way depreciate the due importance of the biological branches of that science. I have indeed been accustomed, throughout my career, to bow to the weight of palæontological evidence, and to this, my earliest and latest faith, I still remain true. But I cannot shrink from thus publicly expressing a feeling which has recently grown strong within me, that the biological side of geology has by some of my cotemporaries been too exclusively cultivated; that palæontology has acquired a somewhat undue preponderance amongst us; and that the value of physical or inorganic geology is not now being sufficiently appreciated. If, indeed, men were in any measure agreed as to the origin and progress of the various forms under which life has been manifested in the history of the world, if they had arrived at a common understanding as to the value of species, if they knew with any approach to completeness how far life is dependent on, and modified by, external physical conditions now, and how far similar relations have obtained in the past, there might be some show of reason for the paramount authority of palæontological decisions when they are set against physical data. But when we reflect on our slight acquaintance with the laws which regulate the interaction of organic and inorganic nature at the present time, on our ignorance of that interaction in former geological periods, on the little that we know regarding the true value of our fossil species, on the difficulty of ascertaining the true contemporaneity of distant formations, and on the vast mass of fossiliferous rocks still unexplored, it does seem to me that greater modesty and caution in the application of palæontological *dicta* are to be recommended. Whatever may be the doctrine we espouse as to the origin of species, we see on every side of us in the living world of to-day how constantly, and how momentously, the conditions of life are defined and modified by inorganic forces. Apart from, and imperiously governing the progress of life around us, there is the world of physical or inorganic nature—a system of

ceaseless law-directed change, of endlessly complicated agencies working harmoniously together and involving all things, organised and unorganised, in one common mutability. If such is the order of nature now, and if our view of nature would be but partial and distorted, in contemplating merely the biological domain, surely we err when we, in like manner, allow ourselves to see things in the past too exclusively through that medium, and neglect to take due cognisance of the evidence of former physical changes.

By neglecting the study of physical geography, geology has become, among certain influential writers, too much the study of palæontology only. Those writers must not forget that there has been a history of dead matter as well as a history of life; that mineralogy, petrography, structural and stratigraphical geology, and physical geography, deal with essential and integral parts of the past history of our planet. Things, indeed, have gone so far, that when there is a conflict of evidence between the testimony of the fossils and that of the rocks in which they lie, such authors, almost invariably, and as a matter of course, bow to the palæontological argument. I have myself done so, even against what I may perhaps have thought, or, at least, think now to have been my better judgment. I cannot but believe that, ere long, a reaction will set in against this tendency. And, in the meantime, some geologists will do well to pause in their too exclusive worship of the biological side of their science. I wish to put this note of warning on record, and to urge my brethren of the hammer to believe that, in the study of fossils, they do not exhaust the possibilities of geology; that there is still a wide non-biological world for them to conquer; that in proportion as they master it they will advance to truer and more comprehensive views of the history of life, and thus aid us in the investigation of that planet with which we, as geographers, are specially concerned.

Conclusion.—In concluding this Address, I now come to the only painful duty I have ever had to perform, since I have had the honour of presiding over the Royal Geographical Society.

I have to bid you farewell, and I do so solely on account of the malady with which I have been visited; for I well know, that if I had not felt it incumbent on me to resign the Chair, your never-failing kindness would have urged me to continue to serve you until the next Anniversary.

In retiring, I have the satisfaction of knowing, that I leave the Society in the most highly flourishing condition, and that I can reflect with just pride upon the progress it has made since the year 1843, when, succeeding to your excellent President Admiral Smyth, I was, by his advice, first placed in the Chair. In the period which has elapsed since that date, I have been for fifteen years your President; and when other persons have been in that post, I have zealously aided them to sustain your interests, and have prepared and read to you sixteen Anniversary Addresses.

In my endeavours to serve you, it was with the heartiest satisfaction that I supported the endeavours to extend Arctic Discovery; and either when I wished God speed to my lamented friend Sir John Franklin, or when that great navigator was missing, I can reflect with honest satisfaction on the fervent—though, alas! vain—appeal I made in your name to her Majesty's Government, to endeavour to rescue him and his brave companions. Then, again, when his devoted wife made that final effort which, through the researches of Sir Leopold McClintock, terminated in establishing the truth as to the fate of those brave explorers, so I never relented in my support of that magnanimous woman, Lady Franklin, until I had the true gratification of presenting to her, in your name, one of our Gold Medals for her heroic efforts.

It would be very bad taste on my part were I to advert to the many instances in which I have been intimately concerned in acts which I know that the Fellows of the Royal Geographical Society have duly appreciated as being of importance. Of these I need not remind you that the attainment of the support of Parliament, and thereby our recognition as an important and highly-useful scientific body, was duly obtained.

Amidst the many duties which it has been my good fortune to perform, I can dwell upon none with more satisfaction than those by which I sustained the daring efforts of the explorers of Africa,—Livingstone, Speke, Grant, and Baker; whilst I have rejoiced in the steadfast pertinacity with which I have upheld my confidence in the ultimate success of the first-named of these brave men. In fact, it was the confidence I placed in the undying vigour of my dear friend Livingstone which has sustained me in the hope that I might live to enjoy the supreme delight of welcoming him back to his country.

I have now only, gentlemen, to offer you my heartfelt thanks

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for the unvarying heartiness with which you have supported your old President, whose name having been, by your kindness, the only one inserted in the Royal Charter by which you are embodied, leaves you with feelings of just pride when he reflects that he has been thus identified with your past and future successes, and that your numbers, which amounted to 600 only when he first was placed in the Chair, have now risen to the large total of 2400.

If, as I hope, you elect Sir Henry Rawlinson as my successor, I anticipate the most gratifying results in your future career; for you will be led forward by an eminent scholar and great explorer, who, as far back as the year 1839, won one of your Gold Medals for his most remarkable researches in Susiana and Persian Kurdistan, and who also determined the former existence of the ancient cities of Ecbatana, and threw quite a new light on the comparative and physical geography of Western Asia.

Since the days of his early researches, which we geographers were the first to recognise and reward, he has rendered his name famous by his able and elaborate works on ancient Babylonia; and whilst on every subject relating to Central Asia he has evinced much knowledge, we have had to thank him for the perspicuity with which he brought our late lamented envoy Mr. Hayward to our notice.

Under his auspices you are destined not only to direct the exploration of vast unknown lands, but also to bring to the mind's eye of moderns many of the past glories of the great eastern empires of antiquity.

Postscript.—Whilst on the point of concluding my Address, I received the melancholy announcement of the death of my old and valued friend Sir John Herschel. This truly eminent man, whose acquirements in every branch of science were almost unrivalled, although not a Fellow of our Society, was an admirable geographer in the largest sense of the word. He had worthily received the highest honours which could be conferred upon him by every scientific Academy of the world; and in 1845 he presided over the British Association for the Advancement of Science, at Cambridge.

The mention of this fact leads me naturally to take this last opportunity in my power of leaving behind me a record, however brief, of the high merits of another most distinguished leader—

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indeed, he was the Law-giver—of the British Association, though he also was not a Fellow of our Society. I mean the Rev. William Vernon Harcourt, to whom I was most truly attached, and who succeeded in giving so great an impulse to the spread of true scientific knowledge. I have no doubt that the President of the Royal Society, Sir Edward Sabine, will do ample justice to the scientific characters of these two remarkable men, who, as well as myself, were long associated with them in conducting the business of that great national body.

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